



The benefits to Australia
and to the global community
from investing in
international agricultural research
and development



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“The benefits to Australia and to the global community from investing in international agricultural research and development”

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Statement from website of
the **Bill and Melinda Gates Foundation**
on the importance of
International Agricultural Research

- Agriculture is the main source of income for several hundred million people around the world who struggle with poverty and hunger, most of whom are connected to small-scale, or smallholder, farms—plots of land roughly the size of a soccer pitch or American football field.
- We invest in agriculture across sub-Saharan Africa and South Asia because research shows that growth in the agricultural sector is the most effective way to reduce poverty and hunger.
- Smallholder farmers in these regions, who collectively supply most of the population's food, are incredibly resourceful in the face of challenges but need new options for sustainably producing and selling a wide array of crop and livestock products, especially as climate change rapidly intensifies the stresses they face.
- Evidence shows that with the right kinds of support, smallholder farmers in sub-Saharan Africa and South Asia can tap the power of food production to create a better life for their families and improve their communities while providing local consumers with reliable access to healthy, affordable food.
- Our investments in agriculture play an important role in the foundation's broader effort to empower women and girls with economic opportunities.

EXECUTIVE SUMMARY

The Crawford Fund's niche and focus on capacity building allows it to complement ACIAR work and leverage its extensive networks. It also allows CF to 'punch above its weight' and achieve lasting outcomes (networks, reputation) beyond initial investments in IAR.

"Capacity development is arguably one of the central development challenges of the day, as much of the rest of social and economic progress will depend on it."

Fukuda-Parr, 2002

Many interviewees noted that their experiences with Crawford Fund had signalled a fork in the road in terms of their personal and professional development. It had also been an invaluable eye opener in terms of understanding contextual and cultural issues relating to agricultural production in developing countries. A recurring comment was that, while capacity and knowledge building *within* one's technical specialisation was great, getting the "bigger picture" made it even better and more effective.

The Fund is already doing well, with very little, significantly enhancing

- Knowledge base – for increased food security and productivity, more effective and sustainable management of natural resources
- The pool of people in Australia and overseas who are eager and equipped to contribute significantly, especially in capacity development
- Relationships and career development opportunities, at multiple scale.

Capacity building has changed over time, and it is perhaps harder than ever to monitor progress in monetary terms. It is more important than ever to have a broad view and holistic approach. We examined which factors help or hinder not just the transfer of skills but the translation of knowledge and knowhow into capacity building. The Crawford Fund has evolved with these trends in recent times: courses are holistic and network based; and the Fund offers mentoring and two-way knowledge exchange. Respondents noted that the organisation had evolved, and the philosophy now was on building learning relationships, not just *imparting* knowledge.

However, there may be opportunities to streamline and focus efforts in more deliberate ways on those elements that are conducive to capacity development. It may also be possible to get even more 'bang for the buck' through a more targeted and strategic approach; in corporate planning and program design – clearer policy, indicators to drive performance or In training program design – a "deliberate bookend" approach.

The value of these IAR networks and relationships lies in the diversity of people represented across different countries, professions, organisations, gender, age and socio-economic backgrounds. The Crawford Fund programs literally break down barriers, silos, and connect people across diverse backgrounds and perspectives. In a very practical sense, this allows for ‘cross pollination’ of knowledge and ideas on how to improve agricultural production and contribute to social and human development goals.

Of course, great science is essential and value for money is important, but ultimately the reason for ACIAR’s existence is to improve the lives of ordinary rural people in Australia’s areas of interest (Indo-Pacific). The case studies identified here, as generating very significant co-benefits (apart from the direct economic benefits) are those that have taken a multi-disciplinary approach to IAR and have also taken the time to monitor and document their impacts. There is no inference that other Projects don’t generate similar benefits (or that they may have adverse impacts). But if the data are not collected during implementation, it is very difficult to confidently draw inferences of attribution *ex poste*.

Any type of IAR may have real and lasting social, economic, environmental and cultural impacts. But it seems to us that the prospects of that occurring are much greater if those directing and undertaking the research:

- have a deep understanding of the context in which their interventions occur;
- have a genuine concern for the potential beneficiaries - the lives and livelihoods of everyone, including for women and minorities, whose behaviours and practices might change, or need to change, as a result;
- ask the question “Will this be enough? Is there anything else that needs to occur concurrently, before the research can achieve its full potential?” and
- closely monitor all impacts of their interventions (using indicators and proxies, where direct measurements are not feasible) during the life of the project’s implementation.

Context matters, in achieving impacts that will be widespread, deep, and enduring.

Understanding the opportunities and constraints (for all stakeholders) is very important, and usually requires a significant investment of time. It would be very naive of visiting researchers to assume that the socio-economic and cultural context in rural areas of any developing countries are very similar to what they are familiar with at home.

Benefits to Australia

This report has noted numerous benefits to Australia from IAR in addition to the widely recognised benefits to partner countries. These include

- Practical knowledge that can enhance Australian agricultural productivity by studying crops of interest in different climatic or agro-ecological conditions
- Biosecurity benefits of studying potential pests and diseases (to both cultivated plants and domesticated animals and to native flora and fauna) **before** they reach Australia

- IAR Relationships and networks that enable prompt and coordinated responses to emerging issues in international plant/animal science
- Detailed knowledge on international trade and value chains that are potentially useful to Australian production and trade.

All of the above, in combination, contribute to influence, “soft power” and an enhanced international reputation for Australia as a serious and significant contributor to the international community, through willingly and freely sharing Australian intellectual property in agriculture.

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1. INTRODUCTION

1.1. BACKGROUND

Investments in international agricultural research and development (IAR) have the potential to generate a range of monetary and non-monetary benefits not only to the recipient country, but also to the donor country. Similar to ‘win-win’ benefits of corporate social responsibility in the private sector, Australia can, and does, gain by being (and being seen as) a good global citizen.

The Crawford Fund is keen to understand what these benefits are, as well as to achieve greater clarity on which conditions help generate the best chances of success and the highest impacts.

A recent study commissioned by the Crawford Fund examined the monetary benefits of international agricultural R&D (with the revision of Derek Tribe’s *Doing Well by Doing Good*). The present review will complement such economics-focused studies, by reviewing the associated social, environmental and diplomatic outcomes of IAR initiatives and investments in capacity building in an IAR context.

THE CRAWFORD FUND

The Crawford Fund highlights benefits to Australia and developing countries of research for agriculture and development; supports Australians in training developing country scientists and farmers, and supports young Australians in their careers, studies and volunteering for food and nutrition security. (Crawford website link [here](#))

1.2. PURPOSE OF THE REVIEW

As described in the Consultant’s Terms of Reference, the purpose of the Review is to:

- understand the social, institutional, governance and environmental outcomes and impacts, as well as soft power and diplomatic impacts of specific IAR activities, particularly of ACIAR and the Crawford Fund;
- identify the critical success factors that explain why some IAR projects are successful whilst others have less impact; and
- draw on the review findings to indicate areas which the Crawford Fund may emphasise in terms of its future training, mentoring and related programs.

The review is not about evaluating programs or projects to determine their merit or worth. As described in Section 2.3 below, the Review seeks to explore personal experiences and insights from a mix of international research leaders, past participants and current mentors of Capacity Development programs, and key subject matter experts to identify aspects of **what constitutes outstanding IAR?** We also focus on Crawford Fund activities that are particularly important in delivering social and environmental outcomes through capacity building.

The TOR for this Review specifically requested a focus on capacity building, gender equality, disability¹ and social inclusion (GEDSI), natural resource management, institutional and governance reforms, and international relationships) in IAR. While covering all areas, this Review has a particular focus on capacity building at the centre of the Review. Firstly, this is core business of Crawford Fund in terms of service offerings and project delivery. But more importantly in our view, it is also the key mechanism or pathway for delivering impacts on GEDSI, governance reforms, institutional reforms and better environmental and natural resources management. Our understanding of these key terms and how they are related is expanded in section 2.3 below and illustrated in Figure 1.

The review team would like to acknowledge and thank all interviewees who gave the time and insights so freely. Without their willing assistance this task would have been much less rewarding and much more difficult.

LIMITATIONS OF THE REVIEW

Over the years, the Crawford Fund, ACIAR and DFAT and key international aid agencies have produced a wealth of reports and documents relating to IAR generally, capacity building broadly, and to program and project deliveries specifically. While this knowledge base has been helpful in terms of refining our understanding of capacity building and defining the approach for this Review, it falls beyond the scope of this study to conduct a literature review of past reports as such. ACIAR has already published 102 reports in its Impact Assessment series. Compared with the vast international and Australian literature on Impact Assessment in IAR, this review is very modest – by design - in its spatial and thematic scope.

Based on the limited available resources and given the relatively short timeline for this project, this Review focusses on identifying patterns and insights on how IAR practice has improved, and how knowledge can be better shared and applied to progress overall development goals.

¹ We did not find evidence of specific mentions of “disability” in the policy documents, strategic plans or M & E frameworks of either Crawford Fund or ACIAR., or in reports of their activities. However, we continue to use “GEDSI” in this report.

1.3. APPROACH TO CAPACITY DEVELOPMENT

The Review approach can be characterised with the World Bank term of a ‘beneficiary assessment’. Put simply, this method seeks to complement quantitative methods and surveys by providing reliable, qualitative, in-depth information from the perceptions of the target group. In this Review, beneficiary assessment seeks to obtain feedback from the target groups to the interventions that were implemented and highlight new information that has not (and could not) emerge from quantitative methods.²

Beneficiary assessments have been used extensively in the agriculture sector by the World Bank as documented in Salmen³ to systematically understand and document the views of their clients with the objective of improving the quality of their services to them. Salmen examined agricultural extension programs in Africa ‘to systematically understand and document the views of clients (of extension programs) with the objective of improving the quality of their services to them.’⁴

Our beneficiary assessment is based on interviews with key informants as summarised in Table 1 below and presented in Appendix 3. Conversational interviews for this Review were of an hour’s duration, and while there was no stringent fixed list of questions, the interviews followed a consistent script (see Appendix 3) for each area of investigation. In addition, the Consultants examined a considerable number of documents, reports, reviews and surveys. These are included in the References (Appendix 4)

Table 1 Overview of interviews conducted

Subject matter area	Number of interviews
Capacity building (general)	5
Gender Equality, Disability and Social Inclusion (GEDSI) and capacity building	3
Mentoring and management of capacity building programs	3
Subject matter experts (4 also interviewed re above topics)	12

² <https://www.dnforpeace.org/resource/beneficiary-assessment/> (access date 3 March 2022) and https://www.betterevaluation.org/resources/overview/towards_a_listening_bank (access date 3 March 2022).

³ Lawrence Salmen, Beneficiary Assessment: An Approach Described, Social Development Department, The World Bank, 1992.

⁴ “The Voice of the Farmer in Agricultural Extension” (AKIS Discussion Paper, Lawrence F. Salmen, November 18, 1999).

It should be emphasised that this is not a literature review or program evaluation in a conventional sense. It is subjective and explorative in seeking to shine a light on key (non-monetary) aspects of IAR. It explores the Crawford Funds' capacity building activities and their contribution to the overall vision and mission of the Crawford Fund mainly as seen from the perspective of participants.

1.4. APPROACH TO ASSESSING WHAT MAKES OUTSTANDING IAR

The team began from the premise that a primary purpose shared by ACIAR and the Crawford Fund is, in layman's terms, *to make the world and our region a better place – safer; more secure, sustainable and equitable; reducing poverty and hunger and empowering rural people to build better futures for themselves*. Australia approaches this challenge by sharing Australia's well-recognised expertise in R&D in agriculture (broadly defined to include cropping, livestock, food and fibre, forestry, fisheries and natural resource management e.g. soil and water) with **partners** in developing countries. In a sense, the role includes building bridges at multiple scales (country to country, institution to institution and scientist to scientist) to share existing IP and create new shared IP, with "no strings attached" rather than on a transactional basis (e.g. we will give you this *provided* that you promise to give us something of equivalent value, in return, at some future date).

It is explicitly recognised that Australia also benefits from such cooperation, e.g.

- Greater technical knowledge of primary production activities of interest to Australia, from diverse landscapes and contexts; for example, understanding how crops grow in wetter/drier or hotter/colder places than in Australia can inform "tweaking" of our production systems;
- Biosecurity and "forward preventative measures";
- Global Public Goods, like oceans and climate change;
- Up-skilling Australian experts through their exposure to different international contexts.

Ultimately, all these (relatively short term) benefits to Australia and developing country partners cumulatively enhance Australia's reputation and standing as a serious contributor within the international community (sometimes called "soft power" or more accurately, the ability to influence decisions of others). These benefits are notoriously difficult to measure or even document.

International agricultural research, to promote rural development in its widest sense, is not a precise science (like physics) and continues to evolve over time. There have been major changes in IAR over the past four decades, with a perceptible shift away from a focus on specific crops (wheat, rice, livestock) or specific inputs (like fertilizers, germplasm or water) and the accompanying technical skills and expertise.

It was realised many years ago that "success" in IAR is not *just* about increasing yields/ha, higher live-weight gains for domestic livestock, better pasture, water and fertiliser regimes, or even higher incomes for farm households, although these elements certainly do contribute to "success". The shift was away from focussing on an individual crop and its production, to focus on farming systems, household livelihood strategies for farm families, and overall household well-being, as it became

apparent that higher production did not *necessarily* translate to greater wellbeing. A realisation emerged that *as well as* technical improvements and greater skills, there were many other impediments to improving the wellbeing of farming families e.g. marketing, access to essential inputs such as credit or water, or the social exclusion of particular groups in particular contexts.

Similarly, in the management of natural resources, IAR began to consider context, and analyse “social- economic-ecological systems” and whole Value Chains – for example:

- From preparing boats and nets, right through to the marketing of the fish, not just the point of capture; or
- from tree seedling to finished wood products or horticultural products, not just activities at the time of harvest.

Over time, IAR focus has therefore broadened to include marketing, government policies, institutional barriers and social-cultural factors that kept many small farmers in developing countries poorer than they could have been. These impediments need to be overcome for success to emerge and so understanding of the wider context of agricultural operations has become important.

No matter how well-prepared, well-designed and well-intentioned IAR projects are, there are always exogenous factors that could, and do, go wrong. A portfolio approach seems appropriate, recognising that not every project will be a winner. Successful projects are designed to make a difference - to fit with their context; many are now actively pro-poor, women and minorities rather than just assuming or hoping that women and minorities *might* benefit somehow from general economy-wide or landscape-scale changes.

Many impact assessments have concentrated on estimating net economic benefits from a project, and identifying a causal relationship between the intervention and the subsequent impact. Mayne and Stern (2013) argued that natural resource management research operates under dynamic, complex and unpredictable conditions, and is likely to be a contributory cause rather than the sole cause of program results. They argued for a complementary learning-oriented approach to NRM research program evaluation that focuses more on helping managers learn about their interventions and to understand why and how outcomes and impacts have (or have not) been realised. They demonstrated this by examining some specific examples: the CGIAR Research Program on Aquatic Agricultural Systems (led by Worldfish), CGIAR’s Ganges Basin Development Challenge, and CSIRO–AusAID’s African Food Security Initiative. That approach enhanced our understanding of how and why impacts occur in a research, development and extension environment. They also argued that learning-orientated evaluation leads to more soundly based explanations that can guide researchers in replicating, scaling up and improving future programs.

The Alluvium team began by searching for “exemplar” projects – those that were clearly above average achievements and impacts in terms of Gender Equality Disability and Social Inclusion (GEDSI) environmental outcomes, or governance or policy reforms (as in the ToR). But overwhelmingly we found that projects that did one of these well, tended to do most (if not all) of these well. It seems that it is not necessary, for example, to emphasise GEDSI over capacity building, as they can be mutually reinforcing and pursued simultaneously. As the analysis below will reveal,

many projects manage to excel in all the dimensions of social impact; they are not mutually exclusive.

Rather than being designed to “deliver a technology package of pre-prepared solutions” that might raise the living standards of farmers in general, if they adopt it, many of these exemplar research projects focussed on the needs of farm households in the project area and progressively worked through a prioritised list, progressively solving multiple real-world problems: water quality, market access, institutional or governance reforms, greater technical and managerial skills, or in some cases, policy reforms. Very few problems that they encountered were considered as “out of scope”.

Annex 2 of the companion report, (Mullins et al 2022) provided a starting point for our review. We followed their list of ACIAR Projects under the same general headings:

- Food Security and Poverty Reduction
- Natural Resources and Climate Change
- Human Health and Nutrition
- Gender Equity and Women’s Empowerment
- Inclusive Value Chains and
- Enhancing Science and Policy Capabilities in Partner Countries.

These were supplemented by a few other projects that interviewees suggested. After reviewing relevant reports and comments from interviewees, we then made qualitative assessments based on criteria already described by the DAC of the OECD, and WOMAC W+ for gender issues. (See Appendix 1). The team have looked for noteworthy successes that warrant celebration within Australia; we have reflected on what attributes they have in common but which seem to absent in less successful projects; and developed some recommendations for how to increase the proportion of IAR projects that are likely to be outstanding.

2. CAPACITY BUILDING

2.1. KEY CONCEPTS

Capacity building is a broad term with wide application across a variety of different contexts. In an international development context, capacity building is closely linked to the ability of individuals, organisations and institutions to work together toward achieving development goals, such as the ACIAR overall objectives of food security and poverty reduction; natural resources and climate change mitigation and adaptation; human health and nutrition; GEDSI; inclusive value chains; and longer-term continuous learning.

Over the past decade or so, the way capacity building is viewed and approached in international development has shifted dramatically and is still undergoing change. The concept itself has also been re-articulated from “capacity building” to “capacity development” to highlight the evolving and dynamic nature of true capacity *development*, as opposed to somewhat mechanical and technical nature implied by “capacity *building*”. (For the purposes of consistency with Crawford Fund’s application of the concept, this Review will continue to use the term “capacity building”).

It is useful to understand the term capacity building in its evolution, as this presents a shift in thinking about development that has been witnessed and embraced by Crawford Fund, ACIAR, and DFAT (see Appendix 1).

Table 2 A new paradigm for capacity development (source: Fukuda-Parr et al 2002)

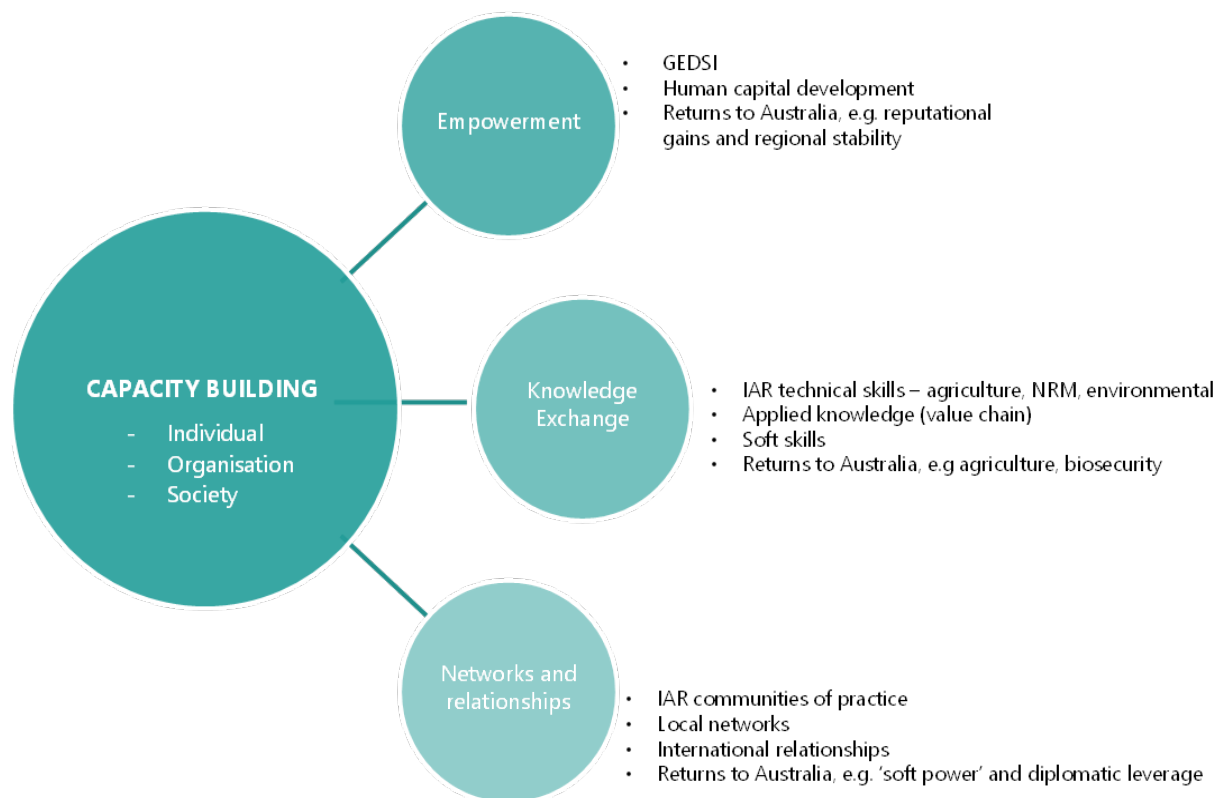
	Current paradigm	New paradigm
Nature of development	Improvements in economic and social conditions	Societal transformation, including building of “right capacities”
Conditions for effective development cooperation	Good policies that can be externally prescribed	Good policies that have to be home-grown
The asymmetric donor-recipient relationship	Should be countered generally through a spirit of partnership and mutual respect	Should be specifically addressed as a problem by taking countervailing measures
Capacity development	Human resource development, combined with stronger institutions	Three cross-linked layers of capacity: individual, institutional and societal
Acquisition of knowledge	Knowledge can be transferred	Knowledge has to be acquired
Most important forms of knowledge	Knowledge developed in the North for export to the South	Local knowledge combined with knowledge acquired from other countries - in the South or the North

Consistent with this understanding, ACIAR views capacity as “the ability of individuals, organisations and systems to perform agricultural research for development effectively, efficiently and sustainably. Capacity building for ACIAR is thus a process of strengthening the abilities of individuals,

organisations, and systems to undertake agricultural research and to continue to advance development outcomes. Capacity building occurs across multiple levels — individual, organisational and institutional — **and is much more than merely transferring skills and knowledge.**⁵

For this review, we are particularly interested in understanding how “training and education” (e.g. Master Classes) can transcend individual career progression or technical competence to become ‘capacity building’ with wider societal benefits. For the purposes of this review, we have identified three key elements of particular importance for the ability of knowledge and skills transfer to translate to capacity building, as shown in Figure 1 and briefly described below. These concepts have been applied to structure our findings from the review (see Section 2.3).

Figure 1 Capacity building in an IAR context



⁵ ACIAR Capacity Building Policy: p2 (2018)

EMPOWERMENT

Essentially, all of the Crawford Fund's programs and initiatives are aimed at empowering people to make a difference. Empowerment, as a concept in international development, originally arose in the context of women's development and has since been appropriated by other actors in international development to mean 'involvement of the poor.' Within the agriculture sector, it is useful to think of empowerment through capacity building across six areas: reduced time burdens; control over incomes and assets; control over health decisions (including reproductive health); food security; leadership; education and knowledge.⁶

Empowerment can therefore mean different things depending on the beneficiaries, the context and other factors. Regardless of the debates around the concept, we have found it useful to return to the original meaning of empowerment as a key thematic area to describe how programs and activities funded by the Crawford Fund have contributed to the empowerment of its beneficiaries and to the overall mission of ACIAR and IAR generally.

We are using the term empowerment in three main ways:

- Specifically for women, in terms of the following four of the six areas described by WOCAN: reduced time burdens, control over incomes and assets, control over their health decisions (including reproductive health), and food security.
- Strengthening the ability of the individual, acting alone or with others, to make positive change in agricultural systems
- We also consider the potential to enable returns to Australia in terms of reputational gains; that is, being seen to 'do the right thing', and to 'do it well', as well as the potential of empowerment to contribute to regional geo-political stability.

KNOWLEDGE EXCHANGE

Crawford Fund's programs and investments in capacity building seek to transfer skills, knowledge and know-how in a way that will result in broader societal benefits and outcomes. This includes both agricultural science and knowledge, practical skills in application of IAR knowledge, as well as 'soft skills' (e.g. leadership, decision making, gender equality, social inclusion, management, communication etc). In a development context, we are particularly interested in how knowledge is used and exchanged.

In mobilising this key concept, we examine the ways in which knowledge generated on an individual level (e.g. through Crawford Fund's programs) may intersect more broadly within IAR communities; within their own organisations; and potentially more broadly across different aspects related to

⁶ This conceptualisation was originally developed by Wocan (link [in References](#)) but may be applied more broadly to disadvantaged community members in developing countries.

agricultural production (e.g. finance, marketing, policy etc) to contribute to communities, food security and nutrition.

Gender Equality, Disability and Social Inclusion (GEDSI) intersects across all of the key concepts shown in Figure 1 above, but particularly knowledge and human development.⁷ The World Bank, UNESCO, and other development organisations acknowledge the crucial importance of education of girls and women to achievement not only of health and social development goals but also national economic goals.⁸ For women to benefit from knowledge and skills programs and education, it is not only important to remove barriers to participation, but also to ensure they feel safe and supported *within* learning environments. It is also important to acknowledge that in different contexts, women have differing levels of empowerment. For IAR, this might mean exclusion from decision making, leadership and other benefits based on discriminatory gender practices.

Knowledge contributes to effective management of resources, the environment, management of food stocks and in a myriad of other ways; leadership for improved environmental and natural resource management as well as to a world in which the benefits of development are more equally shared.

While we acknowledge that knowledge and skills development contribute to an individual's own career progression and self-actualisation, for the purposes of this review we are mainly interested in how knowledge is used and exchanged as a basis for collaboration to achieve broader development goals. We are using the key concept of knowledge exchange in four main ways:

- Agricultural research, scientific knowledge and technical skills acquired by individuals that allow them to participate in knowledge exchange within IAR (formal or informal) communities of practice
- Applied Knowledge and know-how that support social and economic gains resulting from agricultural production, where individuals are able to effectively gain and exchange knowledge related to broader agricultural production contexts and value chains (e.g. finance, funding, marketing, logistics etc).
- “Soft skills” including management, leadership, gender equality, social inclusion, communication, language that allow individuals to collaborate and effectively communicate
- We also consider knowledge exchange in terms of the returns for Australia including increased technical knowledge and skills that can be applied in Australian agricultural production and bio-security, for example.

⁷ For example, the Gender Inequality Index (GII) measures the human development costs of gender inequality. The GII measures gender inequalities in three important aspects of human development—reproductive health, measured by maternal mortality ratio and adolescent birth rates; empowerment, measured by proportion of parliamentary seats occupied by females (leadership) and proportion of adult females and males aged 25 years and older with at least some secondary education; and economic status, expressed as labour market participation and measured by labour force participation rate of female and male populations aged 15 years and older.

⁸ A recent World Bank study estimates that the “limited educational opportunities for girls, and barriers to completing 12 years of education, cost countries between US\$15 trillion¹ and \$30 trillion in lost lifetime productivity and earnings.” All these factors combined can help lift households, communities, and countries out of poverty. (Quoted on World Bank website 2 March 2022: link [here](#)).

NETWORKS AND RELATIONSHIPS

*'Australia's development program is an investment in an open, prosperous and resilient Indo-Pacific. Our engagement is helping our neighbours navigate the challenges of a more contested and disrupted world. Our efforts contribute to saving lives, restarting economies, and managing the effects of resurgent poverty and inequality. We are also engaged in global humanitarian and development efforts, and advocate through our multilateral and global partnerships to ensure they are effective.'*⁹

The key to delivering this outcome is development and maintenance of networks and relationships.

The development of networks and relationships is long term and contributes to sustainability, defined by OECD as 'the extent to which the net benefits of the intervention will continue or are likely to continue.' In order to understand the networks and relationships that have been (and continue to be) developed through the Crawford Fund, we need to understand the different beneficiaries and groups of beneficiaries because there are individual and institutional beneficiaries (including government, civil society organisations, tertiary education providers, agriculture research community, communities, and countries).

We are using the key concept of networks and relationships in three main ways:

- Networks within the agricultural and scientific communities
- Local networks and relationships between individuals and organisations within the developing country, where these networks may extend beyond the immediate agricultural field of study to include other aspects of contributing to development goals through agricultural production (e.g. including government, civil society organisations, tertiary education providers, agriculture research community, communities)
- International networks and relationships (e.g. relating to trade, policy forums, international aid, humanitarian support), where we also consider returns to Australia through reputational gains, soft power, and diplomatic leverage.

⁹ DFAT Annual Report 2020-2021, *Priority 4 Deliver an effective and responsive development assistance program*. Link [here](#).

2.2. OVERVIEW OF CRAWFORD FUND CAPACITY BUILDING INVESTMENTS

The Crawford Fund capacity building investments can be grouped into two key types of activities, Programs and Awards (Table 3), where programs are mainly targeted at capacity building, while awards mainly focused on building motivation, confidence and providing opportunity for networking.

Table 3 Overview of Crawford Fund capacity building initiatives¹⁰

Initiative	Target Group	Type
Next Gen	Secondary school students and tertiary students	Program
Mentoring and e-Mentoring	Open to agricultural researchers	Program
Master classes	Open to agricultural researchers	Program
Scholar grants to Annual Conference and student Awards	Tertiary students	Award
Crawford Fund Fellowship	Open to agricultural researchers	Award
Derek Tribe Award	Open to agricultural researchers	Award

As shown in Table 3, the Crawford Fund has a number of key activities. For ease of understanding we have separated these into two different categories, Awards and Programs. The key features of these two types of activities are summarised in Table 4, below.

¹⁰ There are two additional awards, the Crawford Fund Journalism Award and the Crawford Fund Medal. These are outside of the scope of the study because they are recognition based rather than capacity building awards.

Table 4 Key features of Crawford Fund awards and programs

Award	Key features
Scholar Program Student Awards	<ul style="list-style-type: none"> • Encourages young Australians in international research, development and education for the benefit of both developing countries and Australia • Aimed at networking and mentoring
Crawford Fund Student Awards	<ul style="list-style-type: none"> • State and Territory Committees support visits to developing countries by tertiary students, so they can gain valuable experience and expertise overseas 'in the field'. • Aimed at knowledge
Crawford Fund Fellowship	<ul style="list-style-type: none"> • Awarded annually to provide further training of a scientist in agriculture, fisheries or forestry from a selected group of developing countries, whose work has shown significant potential. • Aimed at knowledge
Derek Tribe Award	<ul style="list-style-type: none"> • Awarded biennially to a citizen of a developing country in recognition of their distinguished contributions to the application of research in agriculture or natural resource management in a developing country or countries. • Aimed at knowledge
Program	Key features
Next Gen (school aged students)	<ul style="list-style-type: none"> • Teaching materials developed for students in years 9 and 10 and senior secondary to encourage them to consider careers in agriculture and development • Aimed at knowledge
Next Gen (tertiary students)	<ul style="list-style-type: none"> • Connected to the RAID network • Aimed at knowledge, networking and relationships
E-mentoring and mentoring	<ul style="list-style-type: none"> • Mentoring through volunteering overseas (New Columbo Plan) • Online events, blogs and videos, webinars • Aimed at knowledge, encouraging young people (school age and undergraduate) to consider a career in agriculture and development

Master Classes	<ul style="list-style-type: none"> • Master Classes are often delivered in partnership with other key agencies, including ACIAR, CSIRO, CGIAR Centres, universities and State Governments. • Classes can consist of lectures, discussion sessions, video presentations, laboratory work and field visits. Skills covered include those relevant to the following areas: <ul style="list-style-type: none"> • Market access, biosecurity and food policy • Sustaining agriculture's natural resource base • Global change and risk assessment • Science communication, information technology and intellectual property. • Aimed at practicing agricultural professionals and knowledge and empowerment
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Participants

Information provided by the Crawford Fund shows the following beneficiaries (including state-based awards) disaggregated by sex (Table 5).

Table 5: Crawford Fund participants

Activity and time span	Female	Male	Total
Conference Scholars (2010-2020)	204	114	318
Student Awards (2016-2021)	62	32	94
E-mentoring and mentoring – 59 pairs in 2021 and 2022	12 mentors 19 mentees	47 mentors 40 mentees	118
Master Classes (2011-2022)*	254	411	665

* Data provided by Crawford Fund. There were 22 Master Classes over the period 2012-2022, involving 111 days of training for a total of 665 participants.

In 2015 the Crawford Fund commissioned a review of Master Classes and training. This report includes data from 1992-2015. Data included in summary tables is not disaggregated by sex and the report is best described as gender blind.

2.3. KEY FINDINGS FROM INTERVIEWS

This section provides a summary of key findings from the review, as related to the identified capacity building impact areas (as per Figure 1 above); critical factors for successful capacity building; and benefits of investing in IAR capacity building. This section is primarily based on the interviews and supported by secondary data where relevant.

CAPACITY BUILDING IMPACT AREAS

Empowerment¹¹

Empowerment was a strong theme throughout the interviews. Participants, and especially females, expressed strong positive views on how the Crawford Fund programs help build confidence, motivation and energy around a shared desire of improving agricultural production and supporting

Having someone believe in you, someone to help build your confidence, is critical - particularly for women, who might not otherwise put themselves forward.

(Master Class participant)

broader development goals. While empowerment and career advancement on a personal level could not solely be attributed to Crawford Fund experiences, many interviewees noted that their experiences with Crawford Fund had signalled a fork in the road in terms of their personal and professional development and been an invaluable eye opener in terms of understanding contextual and cultural issues relating to agricultural production in developing countries.

The Crawford Fund does not have an explicit stated policy, or any programs or awards, specifically designed to address gender inequality. However, it is fair to say that women are well represented amongst recipients of awards and participation in programs such as the Master Classes.

Women interviewed for this review included a mix of Australian and Pacific women. All of the women had benefitted from a number of Crawford Fund Awards.

One manager and mentor of early career scholarship participants at a university in Australia commented that the '*modest investment of Crawford has a huge impact*'¹² and that the program had empowered the five postgraduate/PhD students he had supervised to pursue careers in independent research and agricultural science fields.

¹¹ It is important to reiterate that the interviews were mainly conducted with Australians involved in agricultural related development work (either as researchers, mentors, or managers of programs). These limitations in the study mean that broader equity issues and empowerment opportunities for people from development countries are not directly addressed in this section. It is worth noting that given the limitations of the financial support (e.g. to cover flights and stipend) there may be significant financial barriers for participants from developing countries to gain access to the Crawford Fund initiatives and programs.

¹² Each student received approximately \$5,000 to cover costs of travel and accommodation for their stay, which typically would last approximately 2- 3 months.

Some (Australian) participants described their experiences with Crawford Fund, and especially through the master classes and the mentoring programs, as a launchpad for their careers and passion for working in in developing countries. One participant noted that the experience had *'opened a whole world'* for them. Another interviewee commented that the Crawford Fund master class and mentoring program was literally a springboard for them to pursue a career in international agriculture policy within the UN.

All participants highlighted the crucial role of mentoring to confidence building and creating a sense of empowerment. Without exception, participants felt this to be one of the most important aspects of the Crawford Fund's capacity building programs, eclipsing even the scientific knowledge and know-how obtained through the importance of the training sessions themselves.

Participants who had received mentoring were impressed by the continuity and dedication provided by the mentor, and several commented that they had received (mostly informal) mentoring through Crawford Fund for several years. Participants mainly described the mentoring as being ad-hoc or "added on"; it was not clear to most participants at the onset that they would be offered mentoring, nor did there seem to be a structured approach to integration of mentoring within the capacity building programs (though some commented that this has changed in recent years). A spokesperson from ACIAR commented that in their view, the network of mentors and retired trainers is one of the core strengths of the Crawford Fund.

A PNG woman working in fisheries was able to complete her Masters and PhD degrees and is now serving in a regional role in the Pacific as an expert. She noted that it is rare to see Pacific Islanders in these roles, as often these positions are taken by international staff.

Her first step on the career ladder was through a Crawford Fund Scholar Award to attend the annual conference. Whilst this is now some years ago, she was unaware of ACIAR prior to this award and participation at the conference. Not only is she now a published academic, she reports being well respected in the community, and stated: *'there is a recognition in the community, people see that not a lot of women have gone to that level, among colleagues at well. It is an example of what can happen, we can also look at supporting our students, provide pathways for people in PNG, often internationals get those jobs and the knowledge goes off shore.'*

This empowerment has translated into her starting her own NGO with colleagues to provide support to others in PNG to research so that the knowledge stays in PNG.

Women face a number of other obstacles gaining post graduate qualifications. As a single mother of four children in a patriarchal culture, her mother took care of the children while she studied in Australia over an eight-year period. He eldest son had medical issues and came to Australia for a period of time. She notes that she *"had support from mother and family, but it makes it difficult to do studies. I needed the support, but it is up to the individual. If I had had the 4 of them in Australia, I would not have made it."*

The Crawford Fund completed a 'close of mentoring workshop' in September 2021 and followed up with a survey in October 2021. There were 16 mentor respondents (0=F, 16= M) and 11 mentees. All mentees were based in developing countries, while all mentors were Australia based. In 2021. there were 36 pairs for mentoring (Mentors 3 F and 33 M and mentees, 11 F and 25 M). In 2021 there were 23 pairs (mentors 9 =F and 14=M and mentees 8=F and 15=M).

Over the recent period and because of COVID 19, contact between mentors and mentees was online (zoom, skype etc). Mentors surveyed provided a variety of individualised support based on the specified needs of the mentee. This included support for grant writing, support for academic writing of publications, support designing, surveys, support with developing international linkages, communication skills, leadership and management.

“ACIAR and CF used to principally be about on-ground productivity factor enhancement. Programs now include learnings on ‘pieces of the puzzle fit together’; the approaches and instruments that are necessary to take agricultural products to scale/market, such as value chains, partnerships, policy, institutional aspects.”

(Subject matter expert)

COVID-19 CONSIDERATIONS

Generally, interviewees noted an appreciation that Crawford Fund’s initiatives were continuing throughout the pandemic, despite the current difficult situation imposed by the pandemic and associated restrictions to travel. Several participants expressed the view that while not ideal, there were advantages to conducting capacity programs online; namely the potential increased reach and reduction in costs. Several participants also noted benefits in terms of being able to maintain connections with people even when borders are closed, and being able to enlist contacts as “avatars” for conducting on-ground works and facilitating contacts to other people and stakeholders of relevance to Australia’s interests in IAR. The drawbacks of digital delivery methods mentioned included potential inability to properly connect and build trusting relationships, as well as potential inequity issues relating to unequal access to the internet.

One interviewee noted that mentoring, to a large extent, relies on the building of trusting, ongoing relationships and noted that this may be harder to establish in COVID-19 times of digital interaction: *“without initial face it may be more difficult to establish mentoring relationships online”*. However, at the same time, this interviewee also noted that the COVID restrictions and necessities of virtual meetings and training provided other benefits in the form of broader reach and ability to maintain relations internationally even during a pandemic. Another participant noted that digital delivery would require a more structured approach to learning and capacity building, as the learning itself would entail a weighting of ‘fact and subject matter’ over interpersonal experience and *ad hoc* learning and knowledge exchange.

One participant noted that while online learning and digitalisation could provide broad benefits and wider reach, there may be particular issues in relation to gender equity that need to be taken into account. For example, while it is generally common for most households to have – or have access to – the internet (through either smart phones or a computer), in many countries women are either likely to be the last people to be given access to computers or phones and/or they may have competing duties (e.g. household work, including access to potable water, sanitation, electricity etc)

that prove to be a barrier to access.¹³ If the computer and mobile phone are private household assets, these are generally in the hands of the male family member and during COVID 19 with home learning, these assets are likely to have been needed to be shared across all family members.

At a Federal Government level, the impacts of COVID-19 on the most vulnerable - and namely women, children and people with disability – are considered within the *Partnerships for Recovery: Australia's COVID-19 Development Response* (2020):

We will invest in gender equality and women's economic empowerment. Women are shouldering much of the economic burden of COVID-19. They are more vulnerable to economic insecurity during crises due to an increase in unpaid domestic labour. They often hold less stable jobs, rely on the informal economy for their livelihoods, and may not be part of policy-making processes. (page 10)

KNOWLEDGE EXCHANGE

During the course of the interviews, it became clear that what sets the Crawford Fund capacity building programs apart from regular training sessions, for example, is a combination of:

- Diversity of knowledge types covered through the programs
- Extent of exchange of knowledge
- Organisational learning and development within Crawford Fund

The relationships between these factors is illustrated below and briefly outlined in the following.

While the *scientific* IAR knowledge component continues to be a focal point of the capacity building program (and particularly the scholarship program component). it is the *'enabling'* knowledge that goes with it, that sets Crawford Fund apart:

- the English language skills;
- scientific, publications and proposal writing skills;
- cultural understanding;
- value chain appreciation; and
- applied skills to put scientific knowledge into practice in a developing country context.

For example, one manager and mentor of Crawford Fund early career scholarship participants at a university in Australia noted that the comprehensive nature of the program enabled the students to pursue science-based careers. They noted the importance of being able to communicate effectively – “*in science, publications are currency*”. The manager further noted the importance of learning about cultural contexts, noting that this is the type of knowledge that has to be experienced firsthand.

¹³ Watson et al, *Digitalisation and Women's Workforce Participation in the Indo-Pacific* (2018). Link [here](#).

Similarly, participants who had been supported to travel overseas by Crawford Fund, strongly emphasised the critical importance of cross-cultural learning. In particular, participants highlighted the need to experience firsthand the environmental, institutional, societal governance contexts in developing countries, as these types of learnings are critical to literally bringing the research to life. From paddock to dinner plate, the institutional, cultural, financial or marketing barriers in developing countries are complex and not easily appreciated via textbook learning.

A manager and subject matter expert highlighted the importance of *“making the linkages between trade, investments, markets – and research. [The knowledge exchange...] is not just about productivity growth in agriculture.”* They noted that there had been a shift in recent years, in that the Crawford Fund Master Class courses now include much more content on the “softer” sides of agricultural production (not just the science aspects of increasing yields).

“Crawford Fund provides opportunities for people to connect that wouldn’t otherwise meet – this doesn’t happen often in agricultural science as people otherwise tend to stick to their fields of research/regions.”

(Master Class participant)

Finally, the knowledge exchange takes place within the Crawford Fund organisation itself, as part of a self-reflecting process and a non-formalised continuous improvement process. This point is less than obvious, but critical to the success of the capacity building. As one participant commented: *“Capacity building depends on a humility of knowledge – benefits will not be realised unless trainers show respect, humility and true exchange of knowledge”*. Some managers and participants with long-standing involvement with Crawford Fund observed a shift over time (and especially during the last ten years or so) in this regard from within the organisation. One person noted that the organisation had kept up with the times, and the philosophy now was on building learning relationships, not *imparting* knowledge. They further noted an appreciation of the younger generation of scientists who are now involved in the Fund’s work.

One woman noted, *‘Investments in knowledge and learning is sustainable, something so positive and learning and contributing and feel like you are making a difference for people. Satisfaction, working with and genuinely contributing and wanting to help.’*

It is this diversity of types of knowledge and the tentacles in its exchange that provides the real value for participants, for the people who benefit from application of the knowledge, and for Crawford Fund itself in ensuring it has the capacity and ability to meet the evolving requirements of a changing world. However, while all participants agreed and appreciated the value of knowledge sharing, several of the interviews also highlighted that the sharing of knowledge was individualised and *ad hoc*; e.g. while the Crawford Fund initiatives initially facilitated and enabled knowledge sharing, it would then be up to the individual to follow through as it was not structured into the program.

One participant put it this way: *Short 3-day classes can be very useful – but they need to be supported by a program of follow up. The course would be much better served if we knew beforehand that there would be follow up – and that there was follow through. The program did not have a deliberate process for sharing information or applying the learning.*

A First Nations woman noted that knowledge gains through the RAID network included, *‘understanding the research institutions and structures within Australia and the CG centres and linking with other female pioneer role models.’* While, *‘it is still quite a white Australian centric organisation, it is more of an accessible platform than others,’* despite, *‘not yet addressing other issues of diversity and inclusion, realisation and knowledge or intersectionality, it is the path to that.’*

One female participant noted that CV- and portfolio-building was a key outcome from the combined effects of the Crawford Fund Scholar Award, participation in RAID and the Crawford Fund Fellowship. Benefits included *‘international experience working with international organisations (ICTA), and mentoring by local Kenya women* that enabled her to form *friendships and professional relationships and to connect to some of those local Kenyan researchers and a female researcher in Canada through old supervisor. A Kenyan women came to Australia and this awardee supported her in an application for Homeward Bound training program and an application to the University of British Columbia.* The Crawford Fund has therefore contributed to indirect outcomes over a sustained period of time.

A further aspect of knowledge sharing is the Next-Gen teaching and learning materials developed for students in years 9 and 10 and senior secondary levels. There have been 163 downloads of the materials from the Crawford Fund website and the materials are accessible from other web-based locations. There is to date no formal or informal data or information about how the materials have been used in schools, but this will begin soon. The materials are notable from a GEDSI perspective because there is one recent module, ‘Gender Dimensions in Agriculture.’ Other topics include Climate Change, Food and Nutrition Security, Climate-Smart Technologies, Covid-19 and Food and Nutrition Security, and Australia – A Powerhouse for Agricultural Research. Whilst this is not a clear example of knowledge exchange between countries, it does the formative work of encouraging young people to consider careers in IAR and promotes the international contribution of Australia to agricultural developments globally amongst Australian students.

NETWORKS AND RELATIONSHIPS

Participants noted that the Crawford Fund programs are not just about a lecturer imparting his or her wisdom; rather the knowledge exchange takes place as a dialogue between participants and trainer/mentor and amongst participants; post-participation within the scientific communities; at a society level when seeking to apply the knowledge to agricultural production; and at a policy and organisational level within the host country and internationally.

All interviewed participants shared an appreciation of the lasting networks and relationships that their experiences with Crawford Fund had enabled. It was not uncommon for networks to be alive and well a decade after they had started. This being the case, several participants noted that participation in the agricultural research community was left up to the individual and was not directly facilitated or structured into the Crawford Fund course. As noted by one participant: *I did get a good network and got to know new people – and some of those relationships are still going today – but the network wasn’t established in a deliberate way. There wasn’t a structured process after the training, it was very ad hoc.* Mentors surveyed noted that they see the relationships with

their mentees as ongoing despite the end of the formal mentoring relationship, with one stating, *'A very positive experience, I have a new colleague and friend. I would be so keen to visit Iran.'*

Several participants commented that the value of these networks and relationships lies in the diversity of people represented across different countries, professions, organisations, gender, age and socio-economic backgrounds. The Crawford Fund programs literally break down barriers, silos, and connect people across diverse backgrounds and perspectives. In a very practical sense, this allows for 'cross pollination' of knowledge and ideas on how to improve agricultural production and contribute to development goals. As one participant noted: *Science is good for producing output. To get impacts we need to consider multidimensional ways (science and tech, finance, policy) and connect people across agricultural research, trade, marketing, etc.*

Extending the above observation regarding the importance of cross-cultural learning, the ability to gain a multitude of perspectives from different people - and all within the same network - is invaluable in order to learn how the agricultural research might best be applied in a developing country context. As noted by one mentor, they get *'the satisfaction of cross-cultural interaction and sense of doing something useful with positive outcomes.'* For mentees, the e-mentoring relationship was more about developing skills, knowledge and expertise and given the nature of e-mentoring, this is probably not surprising.

While the value of networks and relationships in a development context cannot be overstated, this is nevertheless an area that is very difficult to measure, and especially over time. One manager noted that: *It is hard to measure [the value of capacity building] - but we need to measure it, even if just imperfectly. We need metrics on the "soft elements" – indicators of value of connectivity. Without getting too caught up in the detail, we need to collect information that can shed light on these aspects of development work which are so important, but which don't get much attention because they are so difficult to report on.*

STATE BASED PROGRAMS

State and territory based programs are an important part of the capacity building efforts of the Crawford Fund. These programs - funded by state and territory governments, industries and universities - were established as linchpins to the Crawford Funds training program which supports practical, short-term, hands-on training tailored to the needs of an individual or for a group to increase the practical skills of agricultural scientists or farmers in developing countries. Managed by volunteers, the state and territory based committees develop and select training of particular relevance to their jurisdiction's strengths, in partnership with Australian research and development agencies and carried out by experienced Australian specialists. As well as the above-mentioned scholarships and awards, they also host local events to celebrate the work they do, encourage greater participation, and draw attention to agricultural development issues and opportunities. In addition to the summary of GEDSI Capacity Building in the South Pacific by the Queensland Committee, (see Box below) some highlights from each of the States and territories are summarised below.

The **Northern Territory** Program recognises the need to promote international agricultural research to assist in the alleviation of rural poverty with an emphasis on Southeast Asia, especially East Timor. It also aims to develop linkages between Territory institutions and agriculture and resource conservation specialists in these developing countries to facilitate the transfer of technology and assist in training for rural and regional development.

The Northern Territory Program aims to identify and develop initiatives that make use of local expertise to benefit countries overseas while also creating educational, business and trade opportunities for Northern Territory. Local business people, academics, rural and fishing industry representatives and others are welcome to provide input into the decisions to be made on the program's focus and priorities for its Northern Territory's constituents. One key activity is the development of school gardens to contribute to diversifying diets, promoting healthy eating habits and improving nutrition among schoolchildren as well as other benefits relating to climate change adaptation, eco-literacy and greening school spaces.

The school garden project is supported by Department of Foreign Affairs and Trade (DFAT) with Charles Darwin University (CDU) and other partners in Papua New Guinea (PNG). It aims to work hand-in-hand with high schools and primary schools to strengthen agricultural education, provide nutritious meals to students, and educate them on good nutrition. Since COVID-19 struck, the project is having some additional benefits, with employment for those hit by the economic strain caused by the pandemic. The project will provide a boost to local food production in the short term and local food security in the long term, as the gardens will supply some nutritious food for the kids attending the schools, and any surplus will go into local markets. The school farms are set up to be financially self-sustaining, so it's a very cost effective and sustainable project. Once initial costs are met and the teachers trained up, the schools are able to maintain the farms themselves.

The long term goal is to work with the schools and teachers on boosting agricultural education, equipping high school kids to make a decent living from agriculture with better entrepreneurial and business skills and uptake of new ideas and technology. In the past PNG had many successful agricultural high schools, so NT is working to understand what made these schools so successful and

how the current agricultural teaching can be revitalised to produce graduates ready to set up small businesses and grow PNG's agriculture sector.

The **South Australian** and **ACT** Committees are tackling crop losses due to nematodes that are common throughout the developing countries of SE Asia. In December 2019, three staff from the Plant Quarantine Section of the Plant Protection Division of the Myanmar Department of Agriculture travelled to CSIRO Canberra and the University of Adelaide to learn about nematode identification, quarantine, management and research. The training was funded by the Crawford Fund ACT and SA Committees. This followed and built upon some earlier training in Laos in 2016.

As a result of the training two junior officers from Myanmar gained valuable experience in nematode identification and took back many images and reference material for pest and quarantine nematodes they had never seen before. Through this experience, they learned about communicating knowledge and possibilities for improving nematology in Myanmar.

Western Australian farmers have benefited from the support provided to developing country trainees by acquiring valuable plant germplasm—Biserrula from Morocco, anthracnose resistant albus lupin from Ethiopia, and black spot resistant field pea from Russia—through the scientific network that the training courses have established. In addition, training in pest and disease diagnosis and control is reducing risks of introducing plant and animal diseases, and problems arising from faulty diagnosis of diseases in products that are exported from and imported into Australia.

Commercial enterprises in WA have benefited from their partnership with the Crawford Fund to support training projects for importers in the efficient use of their products, reducing marketing risks, and enhancing their image as good corporate citizens. The WA committee held a workshop to build the skills and confidence of young to mid-level researchers on data organising, analysing, interpreting and presenting data. Building the capacity of Bangladeshi researchers by developing their skills in statistical analysis and international paper writing was the aim of the short workshop. The workshop involved collaboration between researchers at Murdoch University and CSIRO and was interactive focusing on how to organise and analysis data from the participants own experiments, and how to present and interpret results from different statistical tests. Participants were trained to use JAMOV software for statistical analysis with co-variates, and participants who had complicated datasets or experimental treatments were offered assistance. The workshop showed participants how to interpret and present results involving significant interactions among treatment factors and will result in publications.

The **New South Wales** Committee assessed the community natural resource management situation in sample catchments to jointly prepare a discussion paper on the vulnerability of smallholder farmers and their rural communities to lower farm production, food security, nutrition and livelihoods in Timor L'este. The challenges faced by farmers include uncontrolled rainfall runoff, soil erosion, sedimentation, increased rainfall variability and frequency of drought and flash flooding that are inevitable with increasing climate change.

Two staff at the Ministry of Agriculture and Fisheries Research Division were provided with relevant information and training materials and online discussions were held on some of the key principles, approaches, strategies and techniques to apply when conducting community NRM assessment in

general using a Landcare approach and in the social, cultural and environmental situations that are most common when assessing community NRM and catchment management in Timor L'este.

A particular feature of the **Tasmania** program has been the emphasis on sustainable forestry and fisheries, with a concentration of effort in ACIAR and other projects in those areas undertaken by UTAS, CSIRO and the Tasmanian Forest Practices Authority. Of particular note is that during the COVID-19 pandemic, two papers have been published which derive from the Crawford Fund supported work. The two papers give a good indication of the technical and practical success of the program. The paper in Australian Forestry gives the main practical benefits of the triploid Acacias in commercial forestry, which in Vietnam includes smallholders, with over 50% of the area. The paper in Euphytica covers an important technical problem in breeding hybrids between two Acacia species and whether it is more efficient to use one or the other as the female parent.

The **Victorian** Program has adopted a strategy of selecting and concentrating on projects which will provide cumulative ongoing benefit to developing country agriculture by running programs which build on experience year on year for up to three years. Major crop programs have included cocoa in Vietnam and Papua New Guinea (PNG), potatoes in PNG, dairy hygiene in Malaysia and Indonesia, animal health in Nepal and an ongoing relationship with the Royal National University of Bhutan where they helped to set up a Bachelor of Agriculture degree course and training in research techniques in agriculture. Victorian scientists and technologists have welcomed the opportunities to interact with colleagues and students to help them lift agricultural production in developing countries, while at the same time enhancing the scientific capacity of their own agencies through networking and exchanging knowledge and ideas on food and fibre production.

The program is making greater use of valuable Australian facilities such as the National Grains Genebank and the Australian Animal Health Laboratory, based in Victoria. A future focus will be to increase training in plant biosecurity to complement the work already occurring in animal biosecurity.

GEDSI Capacity Building in the South Pacific by the Queensland Committee

In 2018, the Crawford Fund's Queensland Committee supported a three-day workshop to discuss how gender equality is currently being progressed in agricultural development projects in the South Pacific at the University of Queensland. The workshop involved collaboration by staff from three universities, Dr Lila Singh-Peterson, University of Queensland (UQ), Dr Michelle Carnegie from the University of New England, and Professor Barbara Pamphilon from the University of Canberra. The two main objectives of the workshop were to share knowledge and lessons learnt through applied field experience in the South Pacific and to assist with the development of English writing skills. Outcomes of the workshop included the publication of a series of case studies and chapters around the issue of gender inequity.

The workshop brought together scholars and consultants from the South Pacific with Australian based researchers and consultants to reflect on approaches and methods that they found useful within the context of their work in the field, and to synthesis common learnings and findings across the suite of projects discussed. As shown in the footnote, the workshop provided an opportunity for Pacific based female researchers to publish in an international Journal, on how GEDSI objectives have been approached and progressed specifically in the South Pacific. This is a significant achievement in terms of gender equity and capacity building. Female researchers are often less published than their male counterparts in academia. As well, the publication documents the development of knowledge and perspectives from the global south, contributing to improved decolonisation of knowledge.

Singh-Peterson, L and Carnegie, M (2019). ***Integrating gender in agricultural development initiatives across the South Pacific: customs, values and intersections.*** London, United Kingdom: Emerald Publishing Ltd.

Singh-Peterson, Lila, Carnegie, Michelle, Bourke, R. Michael, Bue, Veronica, Kunatuba, Joanne Lee, Laqeretabua, Ana, Moala, Temaleti Tano, Pamphilon, Barbara and Vilisoni, Marilyn T. J. (2019). *Reflections from the South Pacific – navigating intersectionality and customary contexts to progress gender equality and gender equity. Integrating gender in agricultural development.* op cit;

Carnegie, Michelle and Singh-Peterson, Lila (2019). *The international 'Gender Agenda' in the context of the South Pacific and agricultural livelihoods. Integrating gender in agricultural development.* op cit

Singh-Peterson, Lila (2019). *South Pacific contexts for gender equity scholarship and practice.* In ***Integrating gender in agricultural development.*** op cit (pp. 163-173)

3. CRITICAL SUCCESS FACTORS IN CAPACITY BUILDING

The review has identified a range of factors that are critical to ensuring the continued success of the Crawford Fund's capacity building activities. These are best illustrated in relation to the program staging, as shown in Figure 2 below.

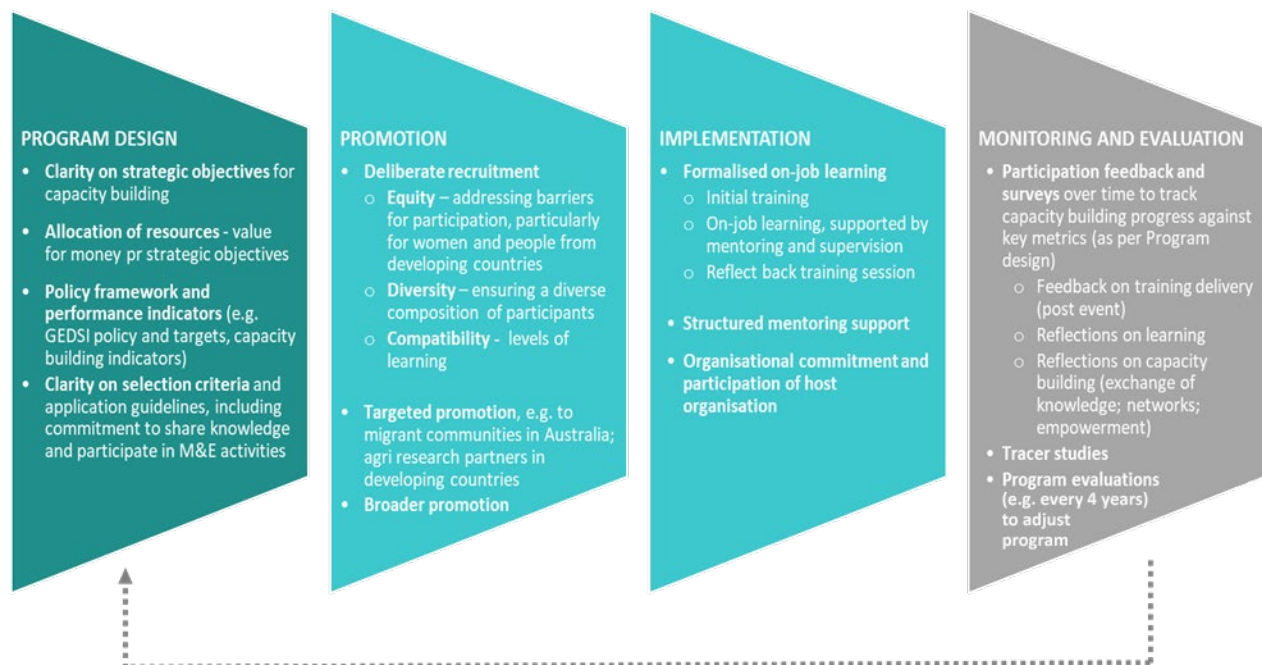


Figure 2 Critical success factors to IAR capacity building

An overarching finding from this review is the critical importance of mentoring to achieve sustainable and longer-term outcomes. This was highlighted by all interviewees as a core strength of the Crawford Fund, both in terms of the program delivery as well as in terms of the extensive resources and expertise available to the Fund through its wide network and alumni. Without exception, the interviewees expressed deep gratitude for the quality guidance and continued support offered by Crawford Fund mentors – where this support has lasted for many years for some participants.

The review has found that in order for “‘transfer of knowledge” ’to become ‘capacity building’, it is essential that there is a commitment and conscious exchange and/or application of knowledge and skills beyond immediate recipient of the training. As indicated in the figure above, this deliberate sharing of expertise and applying knowledge needs to be embedded throughout the program delivery. This may entail (depending on the type of program delivery)

- Commitment and a formalised approach for sharing knowledge and participating in networks and IAR communities of practice (where these opportunities should be communicated at the onset of the program).
- Continued mentoring beyond the training
- Structured learning program that incorporates on the job learning which is supported by (deliberate) mentoring from both a local supervisor/mentor as well as the IAR expert (in this

case Crawford Fund). One capacity building subject matter expert suggested the following ratio as a rule of thumb:

- 20% formal learning
- 70% on-the-job training, supported by a mentor as well as supervisor
- 10% report back and reflection

As mentioned above, the WOCAN W+ framework provides an analysis of 6 domains from which to quantitatively measure women's empowerment in agriculture (Appendix 1). They are time, income and assets, health, education and knowledge, food security and leadership. Our analysis shows that while the Crawford Fund is contributing directly to education and knowledge, there is only indirect contribution to the other domains. It needs to be noted that ACIAR through its Gender Equity Strategy and particularly through the Meryl Williams Fellowship is contributing directly to women's leadership. (see photo of posters below). While women are well represented in Crawford Fund activities, as noted by DFAT, we need to

“.... Go beyond simple beneficiary counting and sex-disaggregated data, and to think through a more nuanced approach to how agriculture investments can bring about gender equality and women’s empowerment.... This process requires ‘front loading’ gender thinking into program analysis, designs and inception phases, rather than retrospectively tacking it on.”¹⁴



¹⁴ DFAT (2015a) Gender equality and women’s economic empowerment in agriculture: Operational guidance note (p. 2).

4. THE WIDER BENEFITS OF IAR INVESTMENTS

In offering Australian technical expertise in agriculture and resource/environmental management broadly defined, ACIAR supplies expertise (rather like the Australian Water Partnership in regard to water resources and catchments) that is embodied in individual Australians with great technical, scientific, research management and engineering expertise. However, this expert knowledge does not automatically translate into real outcomes and benefits. As shown in this review, to realise the benefits of IAR investments, it is critical that programs deliberately incorporate GEDSI, Governance, Capacity Building and Policy aspects **as and when appropriate**- and that the experts themselves are mindful of the broader cultural, economic, social and political contexts in which they operate.

While both Crawford Fund and ACIAR have had very informative, conventional Benefit/Cost analyses completed over recent decades, the “intangible” parts of the development narrative have rarely been told, partly because for decades the M&E systems were not capturing relevant proxies or indicators.

In Appendix 2, we have briefly summarised a few of the many ACIAR projects where significant social and environmental gains have been targeted and achieved. We realise there are many more, but sometimes the reports do not contain sufficient metrics to be able to confidently articulate the full development achievements.

We highlight here four where we think the evidence is extremely strong; they are four very different projects that we believe warrant congratulations and celebration.

The first case-study is from the Philippines island of Mindanao, a notoriously conflict-prone area for many, many years.

Introduction to livelihood improvement through facilitated extension

Livelihood Improvement through Facilitated Extension

Introduction to LIFE

Previous research conducted in less conflict-vulnerable communities in Mindanao by ACIAR and other institutions has shown that certain types of community-based agricultural extension approaches can rapidly improve the livelihoods of farming households. The question was whether these approaches could be re-tooled to be effective in conflict-vulnerable areas. Over the last eight years, this question has been answered by a team of Australian and Filipino research and extension specialists working together under a project funded by ACIAR – the ACIAR Mindanao Agricultural Extension Project (AMAEP).



Previous ACIAR research in Mindanao had focused on the use of the landcare approach to diversify farming systems based on contoured natural vegetative strips and agroforestry. A key component of the approach was the use of trained extension workers, called facilitators, to work with farmers on improving the adoption of sustainable farm practices.

Starting in 2013, the AMAEP team carefully reviewed existing agricultural extension approaches and, from this, developed an extension model targeted at conflict-vulnerable communities – the Livelihood Improvement through Facilitated Extension (LIFE) Model. From 2014 to 2021, the AMAEP team rigorously tested the LIFE Model through a process of action research in 26 conflict-vulnerable pilot communities in the western Mindanao provinces of Zamboanga Sibugay, Maguindanao and South Cotabato. The objective was to evaluate the model for its ability to rapidly improve farmers' livelihoods (primarily economic and social livelihoods) and for its potential to be easily adopted by extension institutions operating in the pilot sites.

Evidence of the success of the LIFE Model at pilot sites includes increased farmer incomes of up to 80%; greatly improved trust and cooperation between previously disparate Muslim, Christian and IP communities; a positive correlation between social capital and economic improvement; and widespread interest in, and adoption of, the model by *barangay* and municipal LGUs. In almost all pilot sites, the improvements have occurred within only six to 12 months from initial engagement.

The Facts of LIFE



Farmers from the AMAEP LIFE pilot site in Nga Bango, Saravia, South Cotabato, proudly display the fruits of their now improved and diversified farming system.

Following the initial success of the LIFE Model, the Department of Science and Technology – Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) commenced a complementary project in 2017 to evaluate the LIFE Model under different institutional arrangements. DOST-PCAARRD is the national government agency that has a particular interest in developing and testing new extension modalities. Through its Technology Transfer and Promotion Division (TTPD), DOST-PCAARRD had been observing the progress of LIFE in AMAEP as part of its role in monitoring ACIAR projects.

This complementary project was implemented from 2017 to 2021 by a DOST-PCAARRD research consortium comprising the University of the Philippines Mindanao (UPMindanao) and the Landcare Foundation of the Philippines Inc. (LFPI), with mentoring support from the AMAEP team. Known as the PULL (PCAARRD–UPMindanao–Landcare–LIFE) Program, it has been further testing the LIFE Model in six additional sites in western Mindanao, again with promising results.



My LIFE story – 20: Jenelyn Ngato

Farmer, South Cotabato

The first LIFE group tells a story of transformation

The remote *barangay* of Assumption in Koronadal City, South Cotabato, was the first site of the LIFE Program introduced by AMAEP in 2014. Since then, the *barangay* has undergone a complete transformation. There is no better individual example of the transformation than 42-year-old farmer Jenelyn Ngato, Treasurer of the Olo-clofe B'laan Landcare Association (OBLA), a farmer group formed by the project in the sitio of Olo-clofe.

'We were so poor before that we could only afford to have one meal a day,' says Jenelyn. 'We were planting corn and banana, but we barely had income from harvesting and selling these crops. We were always short of everything.'

The LIFE facilitators worked with OBLA to identify the best strategies for rapidly improving livelihoods. As part of this, they introduced different methods, such as contour farming and organic farming. They encouraged farmers to plant different crops – coconut, banana, cassava, cacao, vegetables – and implement other livelihood activities such as goat and poultry farming.

As a result, the farming landscape of Assumption has been transformed from corn monocropping and erosion-prone slopes to land that is now filled with a diversity of crops and trees, managed with effective soil and water conservation practices. The community is now being developed as a farm tourism destination through the initiative of local people who are mainly from the B'laan indigenous tribe.



Jenelyn takes up the story: 'Our lives started to change when the LIFE project came to our community. We learned about contour farming and proper planting of vegetables, fruits and trees. Gradually our incomes increased now that we have different livelihood sources. One of my children has graduated from college – I was able to send him to school because I am now earning enough. From one meal a day, we are now able to eat three full meals a day. This is what the LIFE project has brought to us and our community – a better life,' says Jenelyn.

Jenelyn also encourages others: 'I would like to advise my fellow farmers that if there are trainings and seminars in our place, they should come and join us. I really guarantee that they will have great knowledge and it could change the status of their income and life.'

Jenelyn Ngato from remote Barangay Assumption in Koronadal City, South Cotabato, the first LIFE pilot site, has completely transformed her farm. Here, she shows her strip farming technique on steep land devoted to vegetables and other high value crops. Fruit and timber trees are being incorporated on the periphery of her vegetable plot.

The second case study (from East Africa) is another example of IAR that is focussed on delivering solutions faced by many small farmers in the area of operations, in multiple dimensions (in contrast to projects that concentrate on just the science/technology package as if the wider context is less important). It has been mentioned by a number of interviewees who validated its many quite diverse achievements.

Transforming smallholder irrigation schemes in Africa: A guide to help farmers become more profitable and sustainable

Jamie Pittock, Peter Ramshaw, Henning Bjornlund, Emmanuel Kimaro, Makarius V. Mdemu, Martin Moyo, Sithembile Ndema, Andre van Rooyen, Richard Stirzaker and Wilson de Sousa.

The ideas described here were developed through the project *Increasing irrigation water productivity in Mozambique, Tanzania and Zimbabwe through on-farm monitoring, adaptive management and agricultural innovation platforms* that was largely funded by the Australian Centre for International Agricultural Research (project FSC/2013/006). We have not attempted to describe the full range of positive interventions for sustainable irrigation schemes, but rather, report on those that we have tried and that have worked: to turn five of these six schemes around, from situations where the infrastructure was poorly maintained or broken, the farmer organisations were weak, soil fertility was low, water was failing to reach the tail end of irrigation canals, a large number of plots were under-utilised or abandoned, crop yields were very low and, most worryingly, farmers were living in poverty.

Smallholder irrigation schemes are complex systems that only function profitably and sustainably when there is a substantial investment in the capacities of the farmers, their institutions and the formal and informal governing rules. Broken infrastructure is usually just a symptom of a failed socioeconomic and socioecological system. We argue that no single intervention will make these irrigation schemes work; rather, multiple complementary interventions are needed for farmers to use their irrigation schemes to generate good livelihoods sustainably.

Professor Jamie Pittock Project Leader

Research showed that solving system-level problems while simultaneously increasing farmer crop production led to significantly increased farmer income and reduced conflict. System-level issues, such as links to markets, problems with water supply and water sharing, land abandonment and ageing farmers, were resolved by using the participatory problem-resolving approach called agricultural innovation platforms (AIPs). In addition, the simple tools - 'Chameleon' for soil moisture and 'FullStop' for nutrients - provided feedback on farmer management actions that led to farmers changing their irrigation and fertiliser practices, resulting in increased yields and reduced water and labour inputs. Water and nutrient management needs to improve on-farm before any infrastructure intervention. If this is done first then any future technical intervention will reap much greater benefits and, because of increased income, may be properly maintained. This two-pronged approach proved effective across the varied schemes studied in Mozambique, Tanzania and Zimbabwe. The outcomes of the combined tools + AIP approach are increased productivity and profitability, which are critical for the transition into sustainable irrigation communities. The problems faced by

smallholder irrigation schemes, the interactions between AIPs and the tools and the resulting outcomes are shown in Figure3.

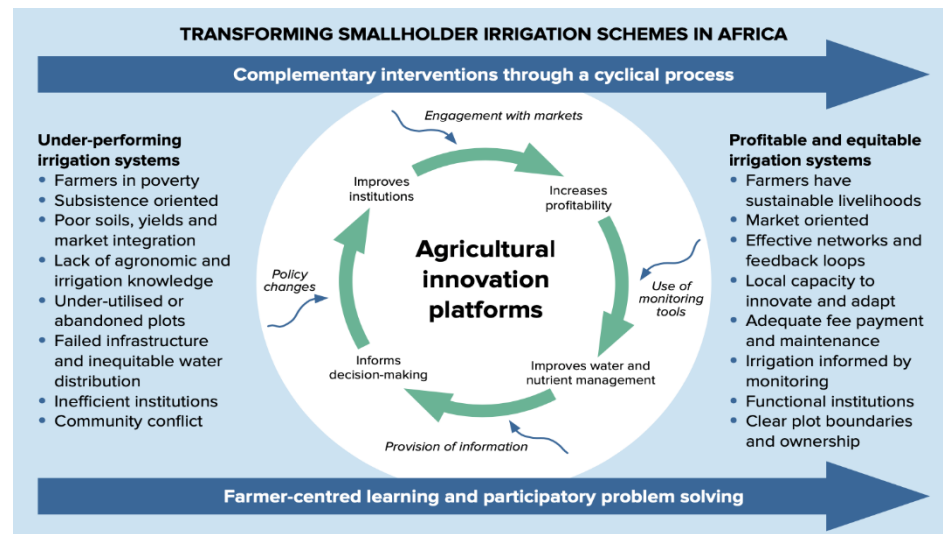


Figure 3: How Agricultural Innovations Platforms lead to significant socio-economic change

Agricultural innovation platforms are multi-stakeholder groups, formed by outside agents, to deal with complex problems that are not being addressed through current processes. In the AIPs, the different stakeholders each have diverse objectives who, by cooperating to diagnose problems, seek opportunities and implement new strategies to collectively test and develop solutions to make the larger systems function better. In short, AIPs create a space for stakeholders to learn together and change, and they aim to increase the adaptive capacity of a system.



Farmers from Mkoba Irrigation Scheme, Zimbabwe. Photo: Andre F van Rooyen

By envisioning a better, functional irrigation system with more prosperous farmers, the stakeholders were able to identify opportunities available to them. The farmers said that they currently had a poorly run irrigation scheme, characterised by high debt, little use of fertilisers and pesticides and few improved crop varieties. They also said that they did not have any grain silos, lacked knowledge of improved farming systems and had minimum draught power. It was also apparent that the

extension personnel were not fluent in the local languages, limiting their effectiveness. The farmers were very concerned about water poaching along the 12-km supply canal.

The farmers said that they wanted to be self-sufficient in irrigation management and food security (Figure 3). They wanted better policies on water fees and maintenance of infrastructure, and they proposed seasonal payments of the water bill. They envisioned that with a well-functioning irrigation scheme they could improve their lives in many ways. They wanted to integrate their cropping and livestock systems with the production of fodder crops, especially on the currently fallow lands. The farmers wanted to produce high-quality food to command a good market price so that their incomes could increase. They envisioned a more diversified cropping calendar, with the introduction of horticultural crops (such as potatoes and leafy vegetables), an indication that the current crops (maize, sugar beans and wheat) are not very profitable. They saw an irrigation scheme that fully integrated women and the youth into agricultural production, to ensure continuity in the scheme. Higher incomes were important to pay school fees so that their children could go to better schools. The farmers envisioned improved access to clean water through boreholes and improved ablution facilities, unlike the existing situation where even drinking water is abstracted from the open canal.



Farmers with sweet potatoes, Silalatshani Irrigation Scheme, Zimbabwe. Photo: Andre F van Rooyen

Traditionally, research on how to improve irrigation water productivity focuses on the ‘hardware’, such as rehabilitating irrigation equipment, rather than the ‘soft’ issues, such as access to markets and information. Interventions are not holistically investigating other challenges faced by farmers in the schemes such as knowledge gaps when it comes to marketing their produce or improving their agronomic practices.

Policymakers also have a role to play in addressing market challenges faced not only by irrigation farmers but also smallholder farmers in general. They have to help create the necessary conditions for profitable smallholder agriculture, by implementing policies that strengthen access to both input and output markets. No single group working independently and in isolation can generate, use or promote effective use of the required technologies, knowledge and approaches. Specific policies that lead to improved farming practices include promotion of high-value crops, on-farm value addition, expansion of systems for extension and technical support, and investment in smallholder technologies.



Farmers selling beans, Zimbabwe. Photo: Andre F van Rooyen

The farmers prepared a map and used it to describe the irrigation scheme when the then Tanzanian Prime Minister visited the scheme in April 2015. It was used again when the then Permanent Secretary of the Ministry of Agriculture and the Director-General of the National Irrigation Commission visited in May 2015. The Director-General mentioned that it was the first time he had seen a scheme with a complete map of the scheme layout with demarcated plot boundaries. He proposed adopting the mapping practice by other schemes in Tanzania and vowed to explore the opportunity of using them to offer Certificates of Customary Right of Occupancy to the farmers. These certificates may be used as collateral in accessing credit from financial and micro-finance institutions in Tanzania. Access to finance is key in overcoming a major barrier to improved productivity of smallholder farmers in Tanzania (Mdemu et al. 2017).

Better yields of high-value crops are necessary for a profitable irrigation industry scheme that provides decent livelihoods for farmers. However, many irrigation schemes are failing, in part because of poor water and nutrient management, which reduces crop yields. Many farmers lack the knowledge needed to identify whether their crops have too much or too little water or access to the requisite nutrients in the soil to thrive. By using the FullStops, about 80% of farmers reported that they have reduced the number of fertiliser applications, from up to three times per crop to only twice per crop season. The change in irrigation frequency using the Chameleon data implies that farmers have been able to control leaching of nutrients, thus enabling plants to use the reduced amount of fertiliser more effectively.

Farmers who used these soil and water monitoring tools said that they have doubled or tripled the yields in their plots. Water productivity for maize, onion and tomato increased by 50% in the first crop season after farmers starting to use the tools. The farmers are realising increased profits and benefits such as saved labour because of the tools.

The third case study highlighted is from the Indian subcontinent.

Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)

The Sustainable and Resilient Farming System Intensification in the Eastern Gangetic Plains (SRFSI) project was a regional multi-partnership project (May 2014 – September 2021) funded by DFAT via ACIAR as part of the Sustainable Development Investment Portfolio (SDIP) in South Asia. The project, led by CIMMYT, aimed to reduce poverty in the Eastern Gangetic Plains (EGP: India - Bihar and West Bengal; North-West Bangladesh; and the Eastern Terai of Nepal) by improving the productivity, profitability and sustainability of small farmers while safeguarding the environment.

SRFSI was proposed for two purposes. Firstly, to establish an evidence base that Conservation Agriculture based Sustainable intensification (CASI) systems could provide productivity, profitability and sustainability benefits to smallholder farmers in the Eastern Gangetic Plains. These farmers experience ongoing poverty and limited development. Prior to SRFSI, CASI was seen as a high potential yet unproven system in the EGP for which SRFSI aimed to address. Secondly, SRFSI supported partners to institutionalise CASI and support its widespread adoption by smallholder farmers for their benefit.

To address the first objective, on-farm participatory agronomy trials and demonstrations built a substantial evidence base to support the promotion of CASI in the EGP. This is evidenced in more than 20 peer reviewed publication covering the various benefits of CASI in the EGP (especially yield, profitability, soil, water, disease, labour use efficiencies and other livelihood benefits). An overall summary of findings indicates that moving from a traditional tillage system to a CASI based system can provide a 10% yield increase, 17% water use reduction, 44% labour use reduction, 62% energy use reduction, 16% emissions education and 56% increase in profits (though these results are summarised across location and technology packages). Overall, the research output and results provide a strong justification that CASI can provide multiple benefits to smallholder farmers across the EGP and should be supported and institutionalised into policy and programming across the EGP.

To address the second objective, original focus was placed on **capacity development** as the pathway to CASI institutionalisation. In terms of capacity development, more than 60,000 people received some form of training through the SRFSI project (with approximately 30% identifying as women). These trainings were across a broad range of potential stakeholders including farmers, service providers, extension agents and policy makers. Additionally, support structures were established through innovation platforms that enabled co-learning and improvement of CASI. This was a substantial catalyst required to increase the knowledge base of communities, extension services and policy makers, and the basis for further establishment of enabling environments. This capacity development also led to substantial further investments of governments in CASI-related initiatives.

Both the agronomy and capacity development phases were integral to creating local ownership of CASI, with knowledge and capacity developed at multiple levels through constant collaboration with partners, both academic and non-academic. In its final years (and during the ongoing COVID-19 pandemic), SRFSI focused on creating self-sustaining enabling environments for the sustainability of CASI scaling beyond the life of the project.

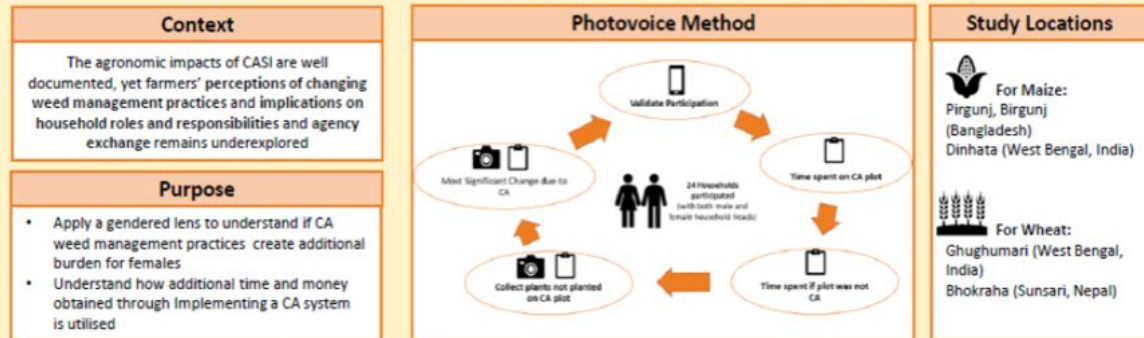
Is Conservation Agriculture 'female friendly'?

Learnings from the Eastern Gangetic Plains of South Asia

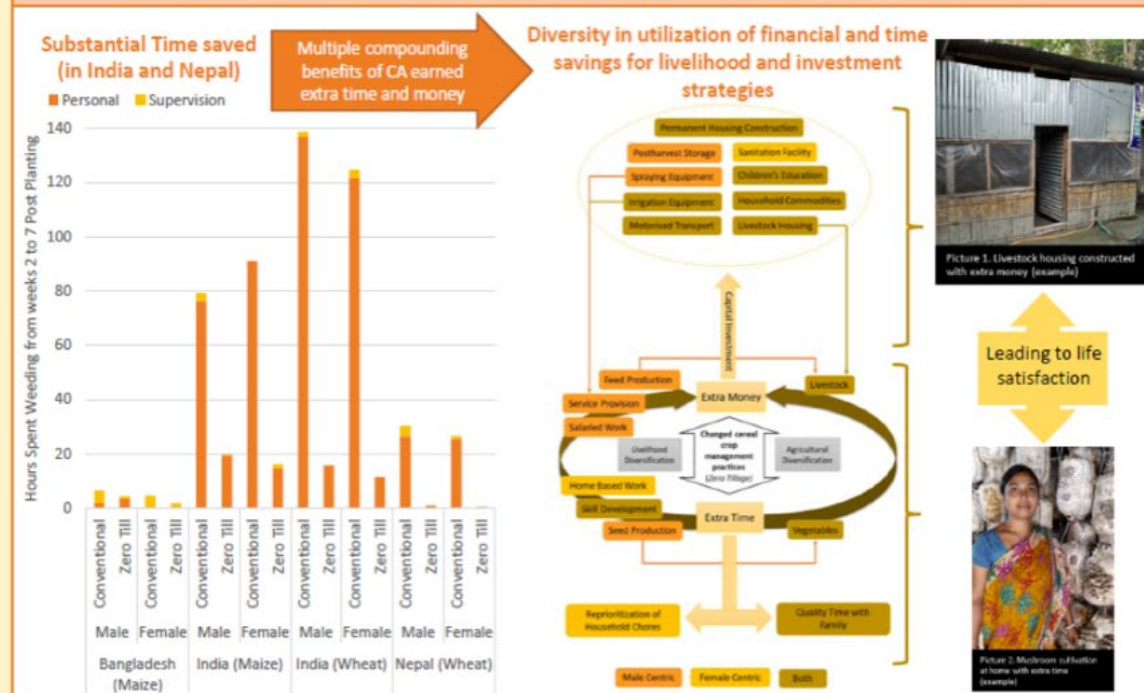
E. Karki¹, B. Brown¹, A. Sharma¹, A. Chaudhary¹, R. Sharma¹, P. Timsina¹, B. Suri²

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Findings: CA does not reinforce or deepen existing inequalities and has multiple secondary benefits!



Conclusions

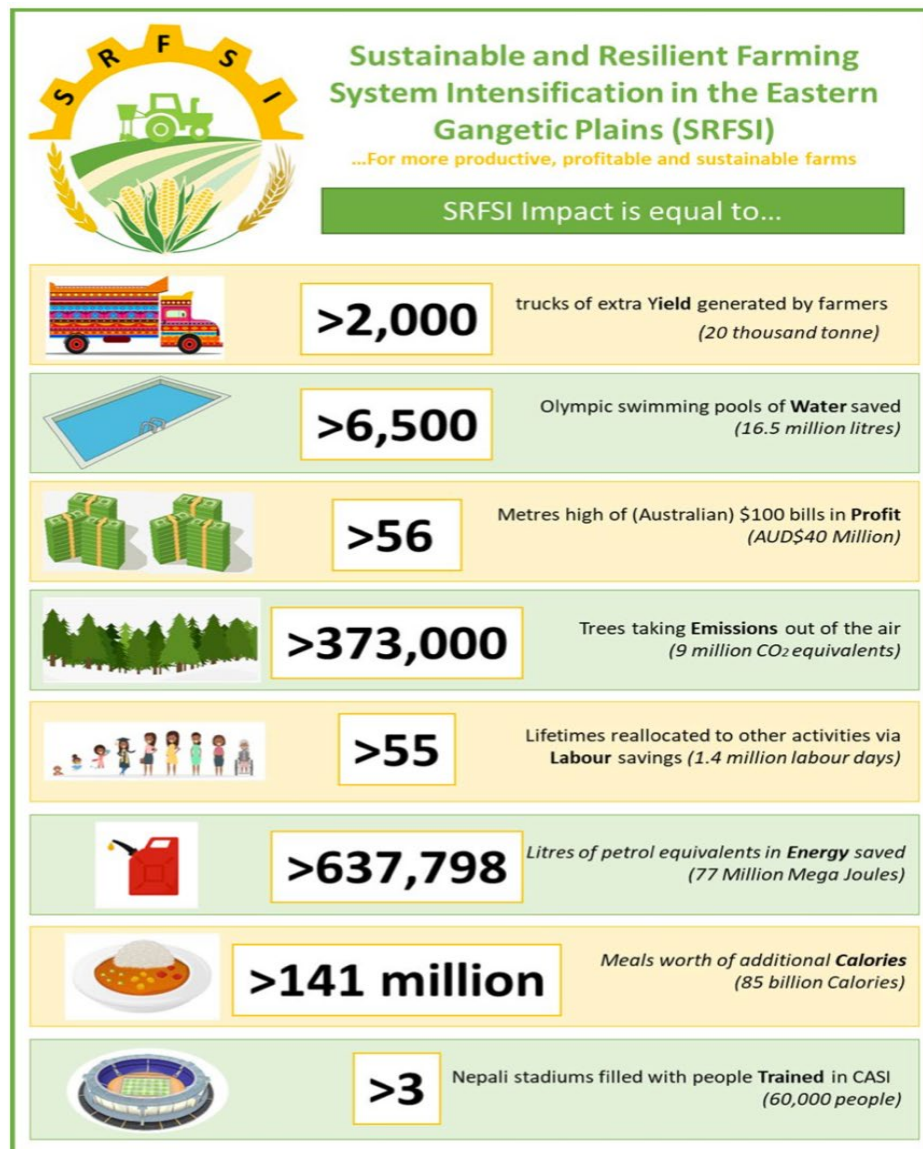
- Household investments link to livelihood satisfaction highlighting overall wealth creation
- Income opportunities for men extend beyond the household domain
- Women tend to engage in home-based work that allows for simultaneous management of household chores
- Future extension efforts focus on weed management and herbicide use
- Benefits of ZT, and more broadly cereal system intensification may be broader than originally envisaged and highlight the importance of exploring direct and indirect benefits with users



The future of farming
Profitable and
Sustainable Farming
with Conservation Agriculture

Online Congress Bern, Switzerland
June 21st-23rd, 2021

Focus was placed in ensuring integration of CASI through convergence with local and governmental programs. This included the commissioning of the regional Centre of Excellence for Conservation Agriculture (CECA). Likewise, huge efforts have been put into development of the SRFSI online digital repository (<https://srfsi.cimmyt.org/>) to make the learnings of the project accessible to different stakeholders to ensure that such knowledge can continue to be used and institutionalised. This also includes the release of the SRFSI Visual Syllabus for Conservation Agriculture, available in three languages, to provide accessible training materials without the need for comparatively expensive ongoing in-person training once the project has ended.



A clear indication of the culmination of these efforts is the convergence evident in West Bengal where state government policy has incorporated CASI in their various operational guidelines and schemes, including the mandatory requirement for three CASI machines in any government supported custom hire centre. In terms of adoption, estimates collated by partners indicate that more than 116,757 farmers are now participating in CASI planting practices as a direct outcome of the SRFSI project. However, given integration with state programs in West Bengal and Bihar, this number is likely to be substantially larger both now and into the future.

The fourth ACIAR case study to be highlighted, is quite different - a project to enhance technical skills in the plantation forestry sector of the Lao PDR.

GEDSI and economic benefits from *in-the-field* capacity development in the forestry sector in Lao, PDR

This case study has been selected for prominence because it illustrates how GEDSI and economic benefits can arise from *in-the-field* capacity development, even in what appears an unlikely context. The Forestry Sector is perceived as notoriously male-dominated, yet a project designed to help build a viable and internationally competitive value chain for plantation-grown trees realised that this Value Chain begins and ends with women.

Women raise the seedlings in nurseries and plant the trees intercropped with rice for the first 2 years. And it ends with women as the majority of workers in the new processing factories (many having been trained by the ACIAR project at its facility at the Forestry Faculty, National University of Laos).

The employers in processing mills say the women are preferred over men because “they don’t come to work drunk, they don’t wreck the machinery, they are much more reliable than men, and have much greater attention to detail and quality control”.

The women appear to be very happy with their new job opportunities.

This case study illustrates that even if a particular project is not designed to be **pro** women or ethnic minorities, a project team that is conscious of its operating environment, and actively questions whether its impacts on women, subsistence farmers or minority groups are positive or negative, can actively collect data to measure and document the impacts. It also shatters some preconceptions to see small Lao women – mothers - who used to be shifting cultivators of dry rice, now driving yellow heavy machinery in a modern industrial complex.

The following pages are part of a larger study compiled by Soy, a young Lao woman currently completing her PhD at ANU as part of the ACIAR project from material collected and published by the ACIAR team of Lao and Australian researchers.



Established in 1990, the Burapha Agro-forestry Company (BAFCO or simply Burapha) is a Lao Swedish plantation and wood products manufacturing company with its own plantations.

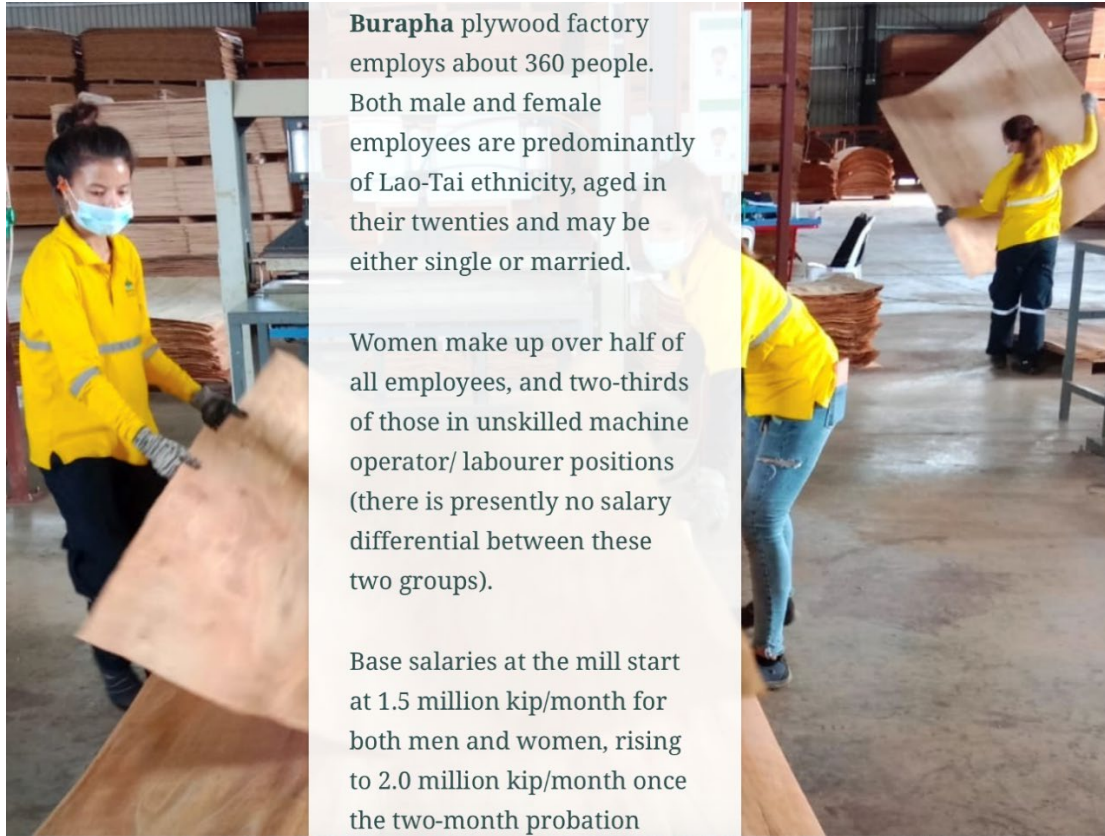
It's plywood mill in Hin Heup district began production in the first half of 2021 with an intake of between 130,000 and 192,000 m³/year of raw material, or between 700 and 1,000 ha of mature eucalypts/year. With a planned rotation period of seven years, the mill needs a total estate of 7,000 ha.

The mill works 24 hours/day in three eight hour shifts.



Women are playing an important role in the Lao wood industry, where they are valued for their attention to detail in finishing tasks such as sanding, gluing and assembly.

Women felt generally satisfied with their work and roles at the company, with pay rates (even though they were lower than men), working hours and training all rated highly.

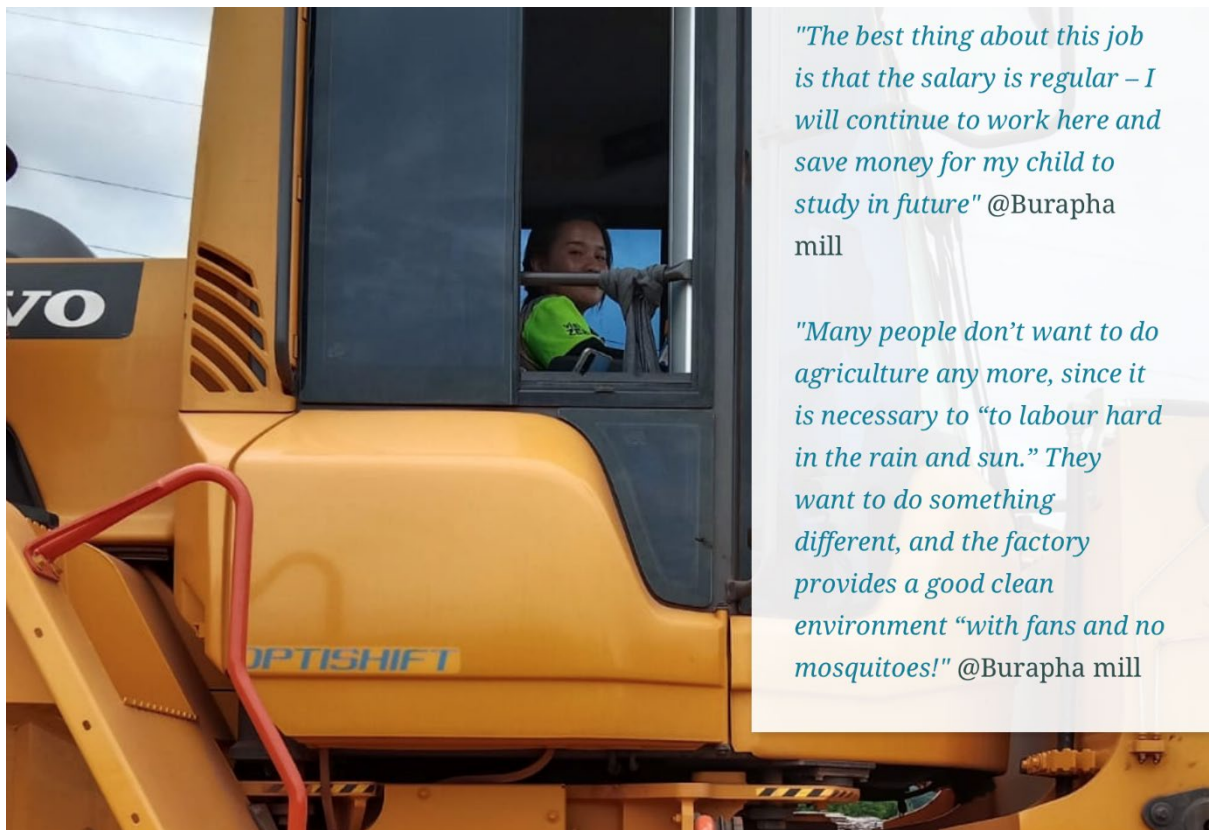


consumption expenditures were water & electricity, transport and beauty products.

Investments, representing 22.3% of expenditure, were focused on home improvement and education.

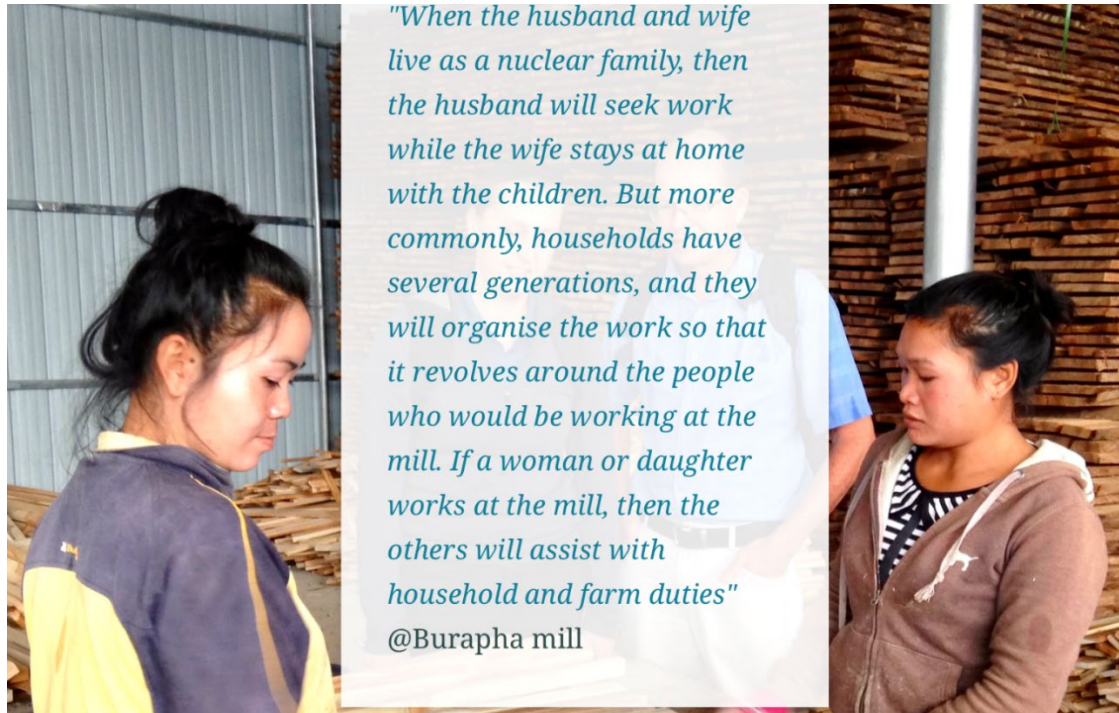
"I have been able to fix the kitchen and bathroom with my wage. Now the kitchen is bigger and the bathroom has tiles and is easy to clean"

"I have been able to pay for my son's education so far with my salary. I hope that he will be able to study further, possibly to become a policeman"



"The best thing about this job is that the salary is regular – I will continue to work here and save money for my child to study in future" @Burapha mill

"Many people don't want to do agriculture any more, since it is necessary to "to labour hard in the rain and sun." They want to do something different, and the factory provides a good clean environment "with fans and no mosquitoes!" @Burapha mill



This study was exceptional, in that it examined the impact on employment from the perspectives of older rural women, many of whom had made (or were in the process of making) the transition from a farming livelihood to a wage labour livelihood.



StoryMap created by Soytavanh Mienmany

Fenner School of Environment and Society, Australian National University

Australian Centre for
International Agricultural
Research

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INTERNATIONAL DIMENSIONS

As discussed above, the ultimate purpose of ACIAR (and IAR generally) is to achieve the development goals (reducing poverty, empowering women, better environment management etc as encompassed in the SDGs). However, undeniably there is also the “foreign relations” or “soft diplomacy” aspects of Australia being held in high regard as a good neighbour, a responsible middle power, willingly sharing its IP and expertise to help neighbours who need it and who will benefit from it.

But to assess or measure such perceptions is incredibly difficult!

Interviewees asserted that we share expertise, build capacity, help improve governance, and so on, because we **believe** (without any absolute proof, or contractual commitments) two things:

- that doing so will lead to Australia being more trusted, respected and even liked, **and**
- that would be much more in our national interest than the opposite.

Interviewees thought that both propositions are correct:

1. helping neighbours, because we can and because they need our help, IS the right policy and has strong multi-partisan support. Furthermore, it underpins so many Australian activities, not just agricultural research for development, but also disaster and pandemic assistance, peace keeping forces, etc.¹⁵
2. being a good neighbour **will** pay off handsomely one day, perhaps in ways we haven’t even imagined yet, but is a much better policy than one of being seen as unfriendly, hostile or mean-spirited.

Good diplomatic relationships based on being a good neighbour can perhaps be seen *an insurance policy that we hope we never have to make a claim upon* (as one very experienced interviewee stated). How much it might be worth spending on such an insurance policy is perhaps impossible to quantify, but many experienced IAR interviewees believed that the answer is “much more than Australia is currently spending, as a nation”. But all of them emphasised the point that expenditure on IAR is not “**transactional**” or with any implied contract. It is a mainly a statement of values, and a strongly held belief.

After a long career in AusAID and DFAT, and now with AWP, Michael Wilson made the point that “*We have proxies for esteem and influence, but no concrete metrics yet. But we’re working on it*”.

¹⁵ Was it necessary for anyone do a Benefit Cost Analysis of Australia’s role in Timur Leste independence or for RAMSI in the Solomon Islands? Or were these also just part of something undefined, *The Right Thing to Do*?

Australia's leadership role in IAR, including the CGIAR and ACIAR, has been very well recognised for decades. A current example of such international leadership is Australia's chairmanship of the *Global Research Alliance on Agricultural Greenhouse Gases* (see text box below).

ACIAR as Chair of the Global Research Alliance on Agricultural Greenhouse Gases

ACIAR is Australia's lead organisation on the Global Research Alliance on Agricultural Greenhouse Gases (GRA) and the current GRA Council Chair, through ACIAR CEO Andrew Campbell. Australia commenced its term as the GRA Council Chair following the Council Meeting in March 2021. ACIAR works with a number of Australian and international research agencies and researchers to develop technologies and farming systems that can increase productivity, deliver meaningful emissions reductions, and build the capacity in our region to deliver our nationally determined contribution commitments under the Paris Agreement. Under ACIAR's leadership, Australia is working to increase the Pacific's involvement and presence on the GRA, as well as assisting in building partnerships to grow climate change action around the world.

Australia is resolutely committed to the Paris Agreement and to working closely with partners in the Indo-Pacific to drive low emissions technologies which will be critical in delivering on the Paris Agreement. ACIAR's role as GRA Chair is a demonstration of that commitment.

Globally, agriculture and the food system writ large are very significant greenhouse gas emitters, of the same order as the energy and transport sectors. Yet there are formidable technical challenges to reduce emissions in agriculture. As so many countries are facing these same technical challenges, it makes enormous sense to share know-how and expertise, to pool our resources, and to tackle these shared scientific challenges together.

Australia is proud to have been a founding member of the GRA and we are focused on measures that can reduce emissions and also help to meet the world's ever-increasing demand for food. Australia has a proud history of research in agricultural emissions over many years. This has already helped to reduce greenhouse gases and increase productivity at the same time – practices that are now being used extensively in agricultural production systems, not just in Australia, but also in other parts of the world.

There is still a long way to go to improve the value proposition for farmers –to overcome the practical barriers to implementation and reduce costs. While the science of greenhouse gases is critical, the social and economic factors are also critical if we want farmers to widely adopt these practices. The Australian Government values the work of GRA members and partners around the world, and we recognise the important role the GRA plays in agriculture, assisting both developed and developing countries to address climate related food security concerns, and developing more resilient agricultural systems.

The Australian Government is committed to supporting the GRA and to strengthen collaboration in global research on agricultural greenhouse gas emissions, and to promote sustainable agricultural production around the world. ACIAR's role in leading that Australian Government engagement has been greatly valued.

Australian Ambassador for the Environment, Jamie Isbister

When done well, ACIAR projects can and do have great impacts, but in many cases relevant information to inform that assessment may not be collected or analysed? Without such information, it is extremely difficult to compile the compelling narratives of success.

There are ways such information could be routinely collected and collated, if it's not being done already. Notwithstanding policies on sustainability, capacity building and gender equity, it is surprising what still **doesn't** seem to be reported routinely in ACIAR reports.

- There are statistics on the number of trainees or workshop participants but not disaggregated by age, gender, ethnicity etc.
- There are data on research publications from each Project, but does the collaboration continue post project? Do the developing country researchers go on to publish successfully post-project, and in their own right?
- Are National Agricultural Research Institutes able to do more, better, higher-impact agricultural R&D than before, due to the investment in skills, training, research methods and research management, post ACIAR support?
- Are developing country researchers more able to initiate and implement their *own* research programs?

We believe that the answers to these questions are affirmative, but the evidence to support that belief remains sparse, or has not been systematically collated yet.

A recent review of the Australian Water Partnership suggested that the AWP executive has “*weak visibility of how GEDSI protocols translate into implementation*”. The same question could be asked of ACIAR and Crawford Fund. This is NOT to suggest that current programs are having no positive impacts or are having any adverse/perverse impacts; simply that the data do not seem to be consistently available to **confirm** the existence of positive impacts.

Metrics and compelling narratives are necessary to show that success is widespread and general, not just the occasional exception. But there are innovative new approaches to this that might warrant further exploration, e.g. using mobile phones or big data, according to former Chief Economist of DFAT, Dr Jenny Gordon.

5. LOOKING TO THE FUTURE

Although it is beyond the scope of this review to undertake an organisational review of the operations of the Crawford Fund, initial indications emerged through the interviews and literature review of what Crawford Fund currently does very well, and where there may be opportunities for improvements.

The interviews and literature research all indicate that Crawford Fund (within a limited budget) is punching way above its weight, so to speak. It has managed to form wide networks and solid relationships within the IAR community and beyond; it continues to expand the existing knowledge base relating to agricultural production; and in more recent years it has succeeded in strengthening linkages to value chain knowledge areas.

It is this ability to literally join people, perspectives and policy areas that empowers participants to actively contribute to achieving broader development goals, namely working toward improving food security, health and nutrition, and participation and equity of women and other vulnerable groups. They do that not only through working in IAR through ACIAR and the CGIAR, but also through national research institutes, universities, local-to-global non-government organisations, UN agencies and even the private sector.

And it is the same ability to 'join the dots' and work laterally that has allowed the Crawford Fund to establish a niche for itself that effectively complements the work of ACIAR, DFAT and other development agencies with the shared overall desire to improve the social, economic and environmental conditions of developing countries while securing Australia's overseas reputation and diplomatic relations. The inclusion of broader and enabling learning opportunities (e.g. English language, academic writing, proposal writing as well as value-chain learning) was deemed invaluable by all participants.

As acknowledged by ACIAR and other subject matter experts interviewed for this Review, these achievements could not have been accomplished without the continued dedication of the Crawford Fund's alumni and wide network of recognised IAR thought leaders and subject matter experts who have extensive experience in working in developing countries. As one interviewee noted: *'the Crawford Fund runs off an oily rag, and this is only possible via the fantastic network of highly skilled and experienced mentors'*.

5.1. POTENTIAL OPPORTUNITIES FOR FURTHER CONSIDERATION IN CAPACITY BUILDING

It is with the current strengths and (budgetary) limitations in mind, as well as the identified critical success factors, that the Review offers the following opportunities for further consideration by the Crawford Fund:

Conduct a program evaluation to consider value for money against the key capacity building aspects and success factors as outlined in this report (namely Section 4). The program evaluation should consider best allocation of resources between the Training, Next Gen, and Mentoring components to achieve greatest possible knowledge exchange, establishment of networks and relationships, as well as empowerment (and with consideration to other Crawford Fund strategic objectives as outlined in the Strategic Plan 2018-2023). It may also consider potential opportunities for reallocating resources *within* existing training programs (e.g. master class, scholarships and mentoring) to introduce a more structured learning program (as per below).

Establish an overall strategic direction and objectives for capacity building program delivery, with reference to the above evaluation (should it proceed) and the Strategic Plan. This could include well defined objectives, clear strategies and actions, as well as equity considerations (and potential targets) – especially for gender, diversity and disability as well as ratio of (for example) participants from developing countries to Australian participants. It should also consider how to diversify the pool of mentors to include more non-Australian and female mentors.

Encourage pro-active promotion, recruitment, and affirmative participation of women in IAR. This could include approaches for supporting and building confidence of prospective female candidates in a deliberate way as well as addressing barriers to participation, such as (and not limited to) by assisting mothers with dependent children and ensuring women's access to technology and the internet. Program design for capacity building might benefit from proactively incorporating strategies to support women's leadership and management and including these in monitoring and evaluation.

Formalise the evaluation and monitoring framework, with specified timelines and reporting formats for tracking progress against strategic objectives and key capacity building indicators. These may include metrics and methods to track contributions and progress in relation to:

- Capacity building measures (e.g. extent to which knowledge exchange, networks and connectivity and sense of empowerment has been realised). This could be measured through user surveys over time.
- Women's participation ratios and qualitative measures such as:
 - Increased promotional opportunities
 - Increased participation in decision making
 - Publications records (disaggregated by sex, and ethnicity)
- Participation of people from developing countries relative to Australia (ratio)
- Career progression of participants (e.g. tracer studies)

Establish a structured learning program for deliberate capacity building that may include:

- Well-defined and measurable learning outcomes that cover a broad range of topics (namely value-chain and writing skills as well as IAR)
- Initial briefing on course outline; expected learning outcomes; potential networks and communities of practice of relevance for ongoing involvement; and participant “contract” that embeds a commitment to share knowledge beyond the course itself. This will help establish clear expectations, awareness, and guide the training in a deliberate way
- Training sessions in group settings, with a diverse participant group that are on similar levels of learning
- On-the-job learning and opportunities for applying new knowledge, where a structured mentoring program (ideally involving the host supervisor or mentor) will motivate and oversee the application of new learnings
- Reflection session, where the on-the-job learning is linked back to the learning outcomes and key take-outs for future progression is identified
- As noted in the 2015 review of the master classes and training, ‘greater focus on gender equity’ and the need to focus on ‘...four overarching themes as a basis for future Crawford Fund Master Classes and training activities’ and ‘Cross Cutting issues such as gender and youth’.¹⁶

Consider cost-effective delivery methods that may include a mix of in-person and on-line delivery methods. Wherever possible, include and prioritise in-person sessions early in the program to help build trusting relationships.

Consider the implications of Agriculture 4.0 (see Box below) especially on the implications of collection of spatial and temporal data to document the social, cultural and environmental implications of the new and emerging forms of agriculture R&D. If Agriculture 4.0 is indeed the way of the future, new techniques maybe possible and necessary to track the implications for GEDSI, food security, capacity building, environmental sustainability and perhaps even good governance and policy reforms. As in the quote above from Dr Jenny Gordon, there are new ways of collecting timely, highly relevant data that also emerge with the digital ITC revolution, such as big data, phone tracking and remote sensing.

¹⁶ Crawford Fund Review of Master Classes and Training activities (May 2015). pg. 2. <https://www.crawfordfund.org/wp-content/uploads/2015/07/Master-Classes-and-training-Review-2015.pdf> (access date 21 March 2022).

A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda

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ABSTRACT

While there is a lot of literature from a natural or technical sciences perspective on different forms of digitalisation in agriculture (big data, internet of things, augmented reality, robotics, sensors, 3D printing, system integration, ubiquitous connectivity, artificial intelligence, digital twins, and blockchain among others), social science researchers have recently started investigating different aspects of digital agriculture in relation to farm production systems, value chains and food systems. This has led to a burgeoning but scattered social science body of literature. There is hence lack of overview of how this field of study is developing, and what are established, emerging, and new themes and topics. This is where this article aims to make a contribution, beyond introducing this special issue which presents seventeen articles dealing with social, economic and institutional dynamics of precision farming, digital agriculture, smart farming or **agriculture 4.0**.

An exploratory literature review shows that five thematic clusters of extant social science literature on digitalisation in agriculture can be identified:

- Adoption, uses and adaptation of digital technologies on farm;
- Effects of digitalisation on farmer identity, farmer skills, and farm work;
- Power, ownership, privacy and ethics in digitalising agricultural production systems and value chains;
- Digitalisation and agricultural knowledge and innovation systems (AKIS); and
- Economics and management of digitalised agricultural production systems and value chains.

The main contributions of the special issue articles are mapped against these thematic clusters, revealing new insights on the link between digital agriculture and farm diversity, new economic, business and institutional arrangements both on-farm, in the value chain and food system, and in the innovation system, and emerging ways to ethically govern digital agriculture. Emerging lines of social science enquiry within these thematic clusters are identified and new lines are suggested to create a future research agenda on digital agriculture, smart farming and agriculture 4.0.

Also, four potential new thematic social science clusters are also identified, which so far seem weakly developed:

- 1) Digital agriculture socio-cyber-physical-ecological systems conceptualizations;
- 2) Digital agriculture policy processes;
- 3) Digitally enabled agricultural transition pathways; and
- 4) Global geography of digital agriculture development.

This future research agenda provides ample scope for future interdisciplinary and trans-disciplinary science on precision farming, digital agriculture, smart farming and agriculture 4.0.

6. CONCLUSIONS

CAPACITY BUILDING

An overarching finding from this review is the critical importance of mentoring to achieve sustainable and longer-term outcomes. This was highlighted by all interviewees as a core strength of the Crawford Fund, both in terms of the program delivery as well as in terms of the extensive resources and expertise available to the Fund through its wide network and alumni. Without exception, the interviewees expressed deep gratitude for the quality guidance and continued support offered by Crawford Fund mentors – where this support has lasted for many years for some participants.

Several participants commented that the value of these networks and relationships lies in the diversity of people represented across different countries, professions, organisations, gender, age and socio-economic backgrounds. The Crawford Fund programs literally break down barriers, silos, and connect people across diverse backgrounds and perspectives. In a very practical sense, this allows for ‘cross pollination’ of knowledge and ideas on how to improve agricultural production and contribute to development goals. As one participant noted: *Science is good for producing output. To get impacts we need to consider multidimensional ways (science and tech, finance, policy) and connect people across agricultural research, trade, marketing, etc.*

Extending the above observation regarding the importance of cross-cultural learning, the ability to gain a multitude of perspectives from different people - and all within the same network - is invaluable in order to learn how the agricultural research might best be applied in a developing country context. As noted by one mentor, they get *‘the satisfaction of cross-cultural interaction and sense of doing something useful with positive outcomes.’*

While the value of networks and relationships in a development context cannot be overstated, this is nevertheless an area that is very difficult to measure, and especially over time. One manager noted that: *It is hard to measure [the value of capacity building] - but we need to measure it, even if just imperfectly. We need metrics on the ‘soft elements – ‘indicators of value of connectivity. Without getting too caught up in the detail, we need to collect information that can shed light on these aspects of development work which are so important, but which don’t get much attention because they are so difficult to report on.*

While women are well represented in Crawford Fund activities, as noted by DFAT, we need to

“.... Go beyond simple beneficiary counting and sex-disaggregated data, and to think through a more nuanced approach to how agriculture investments can bring about gender equality and women’s empowerment.... This process requires ‘front loading’ gender thinking into program analysis, designs and inception phases, rather than retrospectively tacking it on.

THE WIDER SOCIAL BENEFITS OF IAR

Good science and technology, and getting value for money, are essential for successful IAR, but they are not sufficient to achieve high impacts. It can be unhelpful, if not harmful, for expatriate scientists to assume that the local context (social, cultural, ethnic, religious) in a developing country is approximately “the same as back home”. For many types of IAR (but not all) understanding local context is critical

Capacity Building is critical to everything else, and it relies upon relationships, trust and mutual respect.

It is essential to collect and collate the data on Co-Benefits **during** an IAR project (including baselines) to be able to prepare credible narratives about impacts and success. *Ex-poste* is too late, as it is very unlikely to sustain strong inferences of direct attribution (i.e. what action caused which response).

While both Crawford Fund and ACIAR have had very informative, conventional Benefit/Cost analyses completed over recent decades, the “intangible” parts of the development narrative have rarely been told, partly because for decades the M&E systems were not capturing relevant proxies or indicators.

When done well, ACIAR projects can and do have great impacts, but in many cases relevant information to inform that assessment may not be collected or analysed. Without such information, it is extremely difficult to compile the compelling narratives of success in social and wellbeing outcomes.

In terms of instituting a “people-oriented” (rather than crop-oriented or technique-oriented) approach, agencies like ACIAR generally find it more useful to include social/cultural context in all interventions, rather than it being the role of just one unit or Program. The reasoning seems to be that if responsibility is assigned to one specialist unit, all the others may feel freed from any responsibility¹⁷

But while there may be a case for “mainstreaming” GEDSI, Capacity Building, Environmental Management, governance and policy reform, almost all interviewees warned that they should not be reduced to a “Box-ticking” exercise or a formality. They should be included **as and when relevant**, but there will still be cases where a conventional, straight applied science approach is most relevant. Almost all interviewees argued for a “balanced portfolio” of all kinds of approaches rather than a single cookie-cutter model.

¹⁷ In the corporate world, workplace health and safety is now seen as “Everyone’s Responsibility” not just the job of one WHS officer or unit. Similarly, in governments when “Ecologically Sustainable Development” was seen as just the responsibility of the Environment Department, most other government agencies felt they could ignore it with impunity (Productivity Commission, 1999).

As Einstein reportedly once said, *“Not everything that counts can be counted, and not everything that can be counted, counts”*. Many of the most important IAR achievements are very hard to measure. Another old adage is *“If you don’t measure it, you cannot manage for it”*.

This report extends that notion: ***If you don’t measure relevant attributes, you can’t document your successes and publicise them.***

APPENDIX 1 – BACKGROUND AND POLICY CONTEXT

This section summarises the key policy directions of the Crawford Fund; the Australian Centre for International Agricultural Research (ACIAR) who is the major funder of the Crawford fund; and the Australian Department of Foreign Affairs and Trade (DFAT) who provides the overarching policy direction for ACIAR and has implications for the Crawford Fund.

With a large network of esteemed agricultural scientists and policy makers, practitioners, and experienced managers and leaders, the Crawford Fund is uniquely placed within this policy context to help build the capacity of up-and-coming researchers, scientists and leaders in developing countries to progress development goals.

More than transferring knowledge and skills, Crawford Fund builds capacity by enabling connections and networks, sharing of knowledge, and supporting collaboration within countries as well as across borders. This is critical in seeking to support food and nutritional security in a world characterised by the increasing impacts of climate change and in environments where water scarcity and competition for water are major factors.

CRAWFORD FUND

The Crawford Fund receives funds from ACIAR, state governments and other donors. Established in 1987, the Crawford Fund has “contributed to the development of specialist and cross-disciplinary knowledge of over 12,000 international and Australian agricultural scientists and managers. In many cases the training has been related to specific ACIAR projects, whilst several of our master classes have been conceived to fill knowledge gaps identified by ACIAR program managers.”

Target beneficiaries for the Crawford Fund are research professionals and institutions who may benefit from exposure to international agriculture through technical training and skills development.

AUSTRALIAN CENTRE FOR INTERNATIONAL AGRICULTURAL RESEARCH (ACIAR)

From Australia’s annual AUD 4 billion investment in international development, approximately \$100 million/year (or 2.5%) is provided to the Australian Centre for International Agricultural Research (ACIAR). Based on Australia’s development policy and the Sustainable Development Goals (SDGs) ACIAR has developed a 10 year strategy, 2018-2027, with six key objectives:

- Improving food security and reducing poverty among smallholder farmers and rural communities
- Managing natural resources and producing food more sustainably, adapting to climate variability and mitigating climate change
- Enhancing human nutrition and reducing risks to human health
- Improving gender equity and empowerment of women and girls

- Fostering more inclusive agri-food and forestry market chains, engaging the private sector where possible
- Building scientific and policy capability within our partner countries

ACIAR achieves the above through a number of programs. It stresses that it is not a donor. Rather, ACIAR's "core business is to identify research priorities collaboratively with partner countries, commission research and broker research partnerships to tackle identified priorities, and then manage and monitor these investments throughout the research process to maximise impact and return on investment." It funds research projects, fellowships, scholarships, launch (knowledge dissemination) and alumni activities. The Crawford Fund receives some of its funding from ACIAR.

DEPARTMENT OF FOREIGN AFFAIRS AND TRADE (DFAT)

Australia's international development program is informed by the 2017 Foreign Policy White Paper. Developed prior to the global COVID 19 pandemic, the White Paper identifies five objectives of fundamental importance to Australia's security and prosperity.

The Government will:

- promote an open, inclusive and prosperous Indo-Pacific region, in which the rights of all states are respected
- deliver more opportunities for our businesses globally and stand against protectionism
- ensure Australians remain safe, secure and free in the face of threats such as terrorism
- promote and protect the international rules that support stability and prosperity and enable cooperation to tackle global challenges, and
- step up support for a more resilient Pacific and Timor-L'este.

DFAT has developed a COVID Recovery Plan to address the impacts of the pandemic on our development partners, whilst there is minimal attention to agriculture and food security, World Bank reports that the pandemic has reduced incomes and disrupted supply chains. "COVID-19 impacts have led to severe and widespread increases in global food insecurity, affecting vulnerable households in almost every country."

GENDER EQUALITY, DISABILITY AND SOCIAL INCLUSION (GEDSI) POLICY DIRECTIONS

The Crawford Fund, ACIAR and DFAT share a commitment to ensuring greater gender equity in program delivery and many programs have adopted a Gender Equality and Social Inclusion (GESI) or Gender Equality, Disability and Social Inclusion (GEDSI) approaches. However, the extent to which this is articulated and embedded at a policy level differs somewhat between the three organisations.

This section provides an overview of how DFAT, ACIAR and Crawford Fund approach gender equity, disability and social inclusion (GEDSI) within their policy settings. While GEDSI is a shared aim and priority across the three organisations, the policy directions vary.

CRAWFORD FUND

Gender equity strategic directions

- The need to improve gender equity and create dignity and opportunity for women and girls in agriculture. (One of five overarching principles)
- Increasing numbers of developing country women trained in advanced scientific methodologies and leadership and management skills. (One of 12 expected outcomes)
- Improved decision making in agriculture and nutrition because of more high-level involvement of women. (One of 9 anticipated impacts)

CRAWFORD GEDSI POLICY DIRECTIONS

The Crawford Fund does not have a documented Gender Equity Strategy. However, the Strategic Plan 2018-2023 states that it “has long recognised gender inequality as a major inhibitor in improving agriculture outcomes. Consequently, we will continue to pursue fairness and equity for females in all our work.” The Strategic Plan provides overarching strategic direction for gender equity (see pullout box). It does not specify strategic directions for people with disability.

ACIAR GEDSI policy directions

Consistent with DFAT’s policy, ACIAR commits itself to a hard target; “By 2020, 80 per cent of projects reflect principles of gender equity in project design consistent with ACIAR’s Research Proposal Gender Guidelines.” An annual review supports effective monitoring of progress.

Women’s leadership as a principle and the ‘twin track’ approach underpins the ACIAR Gender Equity Policy and Strategy (2020) the ACIAR Gender Mainstreaming Guidelines for Project Proposals (2020) and ACIAR Project guidance note: Project performance monitoring plans (PPMP).

The focus on the Policy and Strategy ACIAR's Gender Equity Policy and "takes a long-term, principles-based approach to gender equity that is applicable to the commissioning and management of research, corporate management and outreach and capacity building. This policy will support ACIAR's gender equity goal within its 10-year Strategy 2018–2027." The strength of the policy and strategy is mandate for at least 50% women's participation in all aspects of capacity building programs and activities.

Consistent with the above, ACIAR has developed the Meryl Williams Fellowship program, specifically targeting female agricultural researchers across the Indo-Pacific to improve their leadership and management skills. The Fellowship contributes to more secure food systems by providing women in agricultural science with greater access to resources and decision making, building collaborative networks, supporting career advancement and driving institutional progress towards gender equity. Over 2020 and 2021 a total of forty-two women working in agricultural research across the Indo-Pacific have been accepted into the fellowship.

DFAT GEDSI POLICY DIRECTIONS

DFAT's Gender Equality and Women's Empowerment Strategy (2016) identifies three key strategies:

- Empowering women's voice in decision making, leadership and peace building
- Promoting women's economic empowerment
- Ending violence against women and girls

The DFAT strategy adopts a 'twin track approach'. In practice, this means that it is possible to develop specific programs to address gender inequality where progress is slow, and/or gender mainstreaming strategies across projects and activities to ensure that

Australia's disability inclusion strategy, Development for All 2015-2020: Strategy for strengthening disability-inclusive development in Australia's aid program (extended to 2021) (Development for All) commits us to strengthening disability-inclusive development in Australia's development program. The strategy, extended to the end of 2021, identifies three key objectives:

- enhancing participation and empowerment of people with disabilities, as contributors, leaders and decision makers in community, government and the private sector
- reducing poverty among people with disabilities
- improving equality for people with disabilities in all areas of public life, including service provision, education and employment.¹⁸

¹⁸ 'Equality' refers to equal outcomes for people with disabilities, enabling their full and effective participation in society on an equal basis with others. The concept of 'equality' is aligned with the Purpose of the Preamble of the United Nations Convention on the Rights of Persons with Disabilities, as seen in Article 1.

The concept of women's empowerment - contributing to women's lives in six domains

Domain	Explanation
Time	Time is a key factor for women's empowerment. Many organisations support women's entrepreneurship, education, maternal health, and food security in the developing world. But until women are freed from the necessary chores that consume so much time, they will make little progress in other areas.
Income and assets	In many regions of the world, women have very limited access to financial or technical assets. Owning property (tools, livestock, land, jewellery), controlling money (having a personal bank account), and making independent decisions about resource use are important leverage points for empowerment.
Health	According to the UNICEF, 66% of the world's work is done by women. This includes work inside the home as care-givers for children and seniors, paid and un-paid labour, food production (cultivating crops, collecting and storing harvests) and resource management (water and fuel).
Education and Knowledge	The benefits of female education for women's empowerment and gender equality are broadly recognized and include decreased fertility, decreased child mortality, improved family health, increases in girls' secondary enrolment, women's participation in paid employment, contributions to household and national incomes, increased political participation by women and increased awareness of rights.
Food security	Improvements in Food Security are critical for women's attainment of economic, social and health improvements. Women are often responsible for ensuring that their families are fed, yet they themselves may go without adequate nutrition.
Leadership	Within developing economies, women are still widely under-represented in decision-making at all levels, in the household, in businesses, and in the public sphere. Addressing these inequities through laws and public policy is a way of formalizing the goal of gender equality.

APPENDIX 2 – EXAMPLES OF ACIAR PROJECTS WITH SIGNIFICANT CO-BENEFITS

To demonstrate the different impacts/achievements of selected ACIAR Projects we have selected 11 projects that would generally be agreed to be “successful” from the 18 Projects documented in Appendix 2 of the Companion volume, *Doing Well by Doing Good* (Mullins et al 2022). After reading available documentation and discussing the projects with people who know them, where possible, the team assigned a simple qualitative scoring system (1 to 5) for each of 6 attributes of interest. The results are in the Table below.

Project	Cap Dev	Rural Wellbeing	GEDSI	Environmental	Governance	Policy Reform	Total
Landcare	4	3	3	3	1	1	15
Fiji Papaya	4	3	3	2	1	0	13
Uganda Fisheries	2	2	3	1	0	0	8
Indonesia Hhld Gardens	4	4	4	3	0	0	15
Africa Agroforestry	4	3	4	4	3	1	19
PNG Family farm teams	2	3	3	1	2	0	11
Pacific Pearls	3	3	3	2	1	0	12
PNG Galip Nut	3	2	2	2	1	0	10
Laos Plantation Timber	4	5	4	3	2	2	20
Science/policy capacity	4	2	3	1	1	0	11
East African S/h Irrigation	5	5	5	4	4	4	27
MEAN	3.55	3.18	3.36	2.36	1.45	0.73	14.6

The scores are only indicative, but they do highlight the different strengths and focus of individual Projects. A striking observation was that for many Projects potentially significant positive impacts were very difficult to validate now, because insufficient pertinent data had been collected at the time of their implementation. It is quite possible that those that score high in this exercise are not

“the most successful” merely those for which the data are available. As noted below, there are very strong grounds to expect Landcare Research Projects would have had multiple positive impacts in different dimensions, but the data to validate that has not yet been located. The CGIAR Gender Platform Project listed below may yet have great impacts, but at the time of writing these seem aspirational rather than proven.

Food security and poverty reduction

Landcare in the Philippines (ASEM/1998/052 and ASEM/2002/051) and investigating the potential of international landcare (ASEM/2018/117)

The ACIAR-funded Landcare projects in the Philippines built directly on tested and proven conservation agriculture practices, complementing these with approaches and mechanisms that would support widespread adoption of conservation agriculture.

A 2019 assessment of results from these investments found that in an up-scaling site in Bohol low income farmers who had adopted contour farming had an increased income in comparison to non-adopters. These changes were more pronounced for farmers who were below the poverty line, suggesting the project had a greater impact for the poorest of the poor. While income improvements were modest, the beneficiaries claimed that the additional income generated from vegetables, banana, coconut, fruit and forest trees enabled them to buy more food, acquire assets, send their children to school and build or repair their houses, among other things.

Additionally, adoption of contour farming resulted in positive environmental changes (reduced soil erosion in their farms, improved farm conditions and less occurrence of landslide). Some beneficiaries even said that their participation in the Landcare project led to some social changes, including gaining for farming expertise recognition and personal growth and confidence building.

The second project undertook a study of the Landcare approach across six countries (Fiji, Indonesia, Philippines, South Africa and Sri Lanka) to determine how sustainable agricultural land management contributes to food security and poverty reduction; better management of natural resources and climate; gender equity and empowerment of women and girls; as well as post-disaster management and recovery, and social cohesion. Furthermore, the study examined whether there are research questions to be answered in the context of agricultural research for development (R4D) and if so, whether these can be addressed in a stand-alone project or better conceptualised over a greater time horizon as a series of projects. Thus, the study aimed to produce an evidence base for ACIAR to assess the role of Landcare for future agricultural R4D and more broadly as an extension model in sustainable agriculture and natural resource management.

Our Assessment

We have every reason to expect that Landcare could and should have achieved the desired impacts in these diverse countries. Unfortunately, we have not yet been able to locate evidence to document this expectation for these projects. There is however an extremely positive independent evaluation *“Landcare - adding value and inspiring change in the Mount Elgon region of Uganda”* by Jason Alexandra (2018) that documents extremely positive outcomes of the kind anticipated elsewhere.

Farmer Behaviour Insights program: Applying behavioural economics to understand farm-household decision-making

This research examines farmers’ behaviour, particularly farm household decision-making of men and women farmers in the Eastern Gangetic Plains of South Asia, particularly in regard to in technology adoption for improving food security and reducing poverty. Poverty and food security remain a challenge in many developing countries. Many of the poor live in the Eastern Gangetic Plains of South Asia, and most of them are smallholder farmers.

Various farming innovations, such as improved conservation agriculture, water management and marketing systems to increase productivity and resilience to climate change, are being developed through agricultural research. Conservation agriculture-based sustainable intensification technologies have been introduced in the Eastern Gangetic Plains, but the uptake and impact of innovation varies widely.

The Project evaluates the value of behavioural economics in understanding decision making by farm women and men, and use these behavioural insights to design/re-design, test and assess selected interventions in agricultural extension, input provision and agricultural service delivery in the Eastern Gangetic Plains. Incorporating behavioural insights may better reflect the context of smallholders in the Eastern Gangetic Plains, and focus on smallholder adoption and adaptation of conservation agriculture for sustainable intensification.



Adoption and adaptation of new technologies depend on farm management decisions made by farm-households. Most studies have focused on determinants of adoption of simple technologies (e.g., improved varieties, fertilizer use) using conventional socio-economic adoption theories. But innovative ways to explain adoption of complex technologies and farming systems innovations are needed. This research aims to provide empirical evidence on the role of behavioural factors including the use of shortcuts, reliance on biases and stereotypes, self-control problems and social preferences on the decision-making by farming households to improve adoption and, hence, alleviate poverty in the region.

Natural resources and climate change

HORT/2008/033: Improving livelihoods through climate resilience in Fiji Papaya industry

The Fijian papaya industry was fragile, being susceptible to natural disasters, shortages of air freight capacity, and post-harvest losses during the wet season.

New production knowledge, communicated to growers through training and factsheets, on the use of drip irrigation, crop thinning to improve papaya quality, cultivar selection, pre-harvest fungicides, and cyclone management. Cyclone management and recovery techniques are now used by most papaya growers in Fiji.

As a consequence of the Project, the Fiji papaya industry is more resilient. The industry has more capacity to recover from natural disaster. Growers, extension officers, researchers and the value chain have all been trained. Pre and post-cyclone mitigation measures have been adopted and additional production knowledge ensures rapid and high quality post-disaster crops. The industry is following Project recommendations and slowly relocating to less disaster prone areas (sheltered and sloped land to avoid floods and cyclone damage).

Women and youth have benefited from a more resilient papaya sector. Smallholder papaya is grown by family units but around 30% of these enterprises are headed by females and 5% are headed by growers under 30 years of age. Skills required for modern commercial horticulture are substantially greater than the sugar industry and the quality of employment available for rural women and young people has been enhanced by the Project.

Both women and young people are attracted to papaya by the crop's favourable financial returns and year-round cash flow. Smallholder enterprises adopting Project recommendations are estimated to have realised a 20.5% increase in annual income. In total, a present value benefit of \$A0.822 million has been estimated for rural women in Fiji as a result of the Project.

Human health and nutrition

Enhancing nutrition through COVID-19 Uganda | Fisheries | Cultivating Africa's Future

During the COVID-19 pandemic, innovations to improve nutrition security have become more urgent. ACIAR is investing in the NutriFish project to harness the nutrients of underused fish-based products to address nutritional deficiencies in Uganda's poor communities. In response to COVID-19, the project fast-tracked the development of a maize flour enriched with nutritious silver fish and amaranth seeds. More than 2.5 tonnes of the flour was distributed to breastfeeding mothers, reducing the incidence of micronutrient deficiencies in children under five years of age.

Gender equity and women's empowerment

Women gain financial independence through household gardens Indonesia | Soil and Land Management | NSW Department of Primary Industries

A 16-year presence in Indonesia demonstrates the value of playing the long game to build trust and focus on working with women. An ACIAR project enjoyed great success in changing soil management practices by engaging with women farmers in Aceh. The project helped to introduce dry season crops and improve fertiliser management in these systems, resulting in improved livelihoods for farming families. Vegetable production in household gardens managed by women increased household income by A\$402 to A\$2,000 per year. A total of 725 women were supported in the project to develop a home garden, with some of these women gaining financial independence as a result and some creating businesses out of the production.

Agroforestry improves gender equity in African smallholder communities in Ethiopia, Rwanda, Uganda | Forestry | World Agroforestry

In most East African countries, agroforestry is spearheaded by women and youth because they comprise most of the labour force on the farm. A critical component of the Trees for Food Security project's success has been the efforts to ensure capacity development activities encompass women and youth. The four-year project has trained more than 7,000 community members on proper methods of tree planting, stakes selection, and fodder production across Ethiopia, Rwanda and Uganda. Of these, more than half were women. Through these initiatives, women have raised their level of disposable income from the sale of timber, firewood, tree seedlings and fruits. The training has also empowered the women to take leadership roles in the cooperatives and groups to further influence decision making.

Family farm teams - ASEM/2014/095

The project sought to support women's economic development in order to improve gender equality, family livelihoods and food security. The **aim** was to enhance the economic development of PNG women smallholders by building their agricultural and business acumen.

As a project focused on empowerment of women smallholder farmers, the project delivered strong **gender equity outcomes at the individual, household and community level**. Many farming families improved communication within their households and began to better understand and re-balance gender roles around household and farming labour. There are many examples of women broadening their goals and taking up leadership roles following their participation in leadership training. In all project areas some women indicated that they gained respect in their village due to their new skills and knowledge, and some men shifted their attitudes towards women's leadership, through it is important to note that many women continued to face barriers and resistance. While these were very positive steps to improve family dynamics and relations, there were mixed reports on whether and the extent to which this led to a reduction in family violence and further exploration of this assumed impact is required.

The project has also delivered important **economic outcomes**. There was evidence of widespread adoption of family team-based farming practices, new agricultural practices and business-like

approaches to farming which led many farmers to increase their incomes and food security. New family-based farming practices also contributed to women's economic empowerment by leading families to more regularly make joint decisions about money. There was also some evidence that other farming families have begun to adopt these practices and positive indications from ripple effect mapping undertaken on previous pilot locations that some uptake is likely.

ACIAR plays key role in development of the CGIAR Gender Platform

ACIAR (along with other leading donors including the Bill and Melinda Gates Foundation, USAID and the Canadian IDRC) was instrumental in the establishment of the new CGIAR Gender (Generating Evidence and New Directions for Equitable Results) Platform. We are committed to tackling gender inequality in research design, delivery and impact and have been a strong and engaged supporter of the platform. ***Integrating gender in agricultural research-for-development in CGIAR is a smart and sensible development as it addresses the needs of both women and men, while recognising and addressing unequal access to resources and decision-making.***

It seemed inappropriate to offer any assessment of the impacts to date from this project because we have been unable to locate any pertinent data.

Inclusive value chains

Enhancing private sector-led development of the Canarium nut industry in Papua New Guinea FST/2014/099

The galip nut project built on a decade of ACIAR research on galip processing techniques and previous EU funding to establish a pilot galip processing factory at NARI in Keravat in ENB. It employed a whole of value-chain approach, researching markets, providing technical advice, building capacity, mentoring businesses, and giving private and public sector stakeholders access to infrastructure. It aimed to attract the private sector into this new agribusiness at three different scales: smallholder and small scale entrepreneurs, SMEs, and large scale processors.

The existence and success of this model did influence other private sector investors to enter the industry. By the conclusion of the project, four private sector processors were processing and selling galip nut products commercially. Given the lack of interest from SMEs and large-scale processors at the beginning of the project, this is a significant achievement. Over the life of the project the NARI factory has directly purchased over 400,000 kina of unprocessed galip nut from small holder farmers and entrepreneurs in ENB and surrounding areas, supporting the livelihoods of over 1300 farmers by the end of 2018. The other processors are now also buying galip nut from smallholders, with an estimated farm-gate value of 300,000-400,000 kina per annum. Case studies indicate that this additional income is assisting women smallholders to cover living expenses and pay for costs associated with schooling and health care.

Enhancing Science and Policy Capability in partner countries

Evaluating the impact of ACIAR's capacity building program

Global | Capacity Building

A 10-year tracer study of the John Allwright Fellowship Program (JAF) has revealed impressive results. Up to ten years after completing their studies in Australia, more than 60% of alumni still have current, active links with ACIAR staff. Also, a significant majority (85%) of alumni remain active agricultural researchers. The survey covered 378 alumni over the period 2010-2019, including 108 women and 270 men.

The following graphs provide a visual representation of the scoring for these projects. While the first 2 projects selected are similar to the average for these 15 projects, the third (Uganda Fisheries), clearly scores lower than average in all dimensions, while the fourth (Indonesian Household Gardens), clearly has above-average scores with respect to GEDSI, Capacity development and environmental outcomes.





APPENDIX 3 INTERVIEWS

All interviews were conducted during the January to March 2022 period, mainly via Zoom conversations (four were face-to-face) . Approximately 30 requests for interviews were sent to alumni of the Crawford Fund, and senior researchers in the CGIAR system and National Research Institutes internationally so the response rate was approximately 50%. Those who did respond were very happy to be interviewed and contributed generously.

Name	Organisation	Crawford participation	Description
David Shearer	CGIAR		
Mike Wilson	AWP		
Dr Jenny Gordon	Ex-DFAT		Chief Economist
Dr Hilary Smith	ANU & ACIAR		ACIAR Project
Emeritus Prof Lesley Potter	ANU		
Dr Jamie Isbister	DFAT		Ambassador for Environment
Petra Schmitt	World Bank,	Research Mgt Master Class	ex-CGIAR
Dr Rohan Nelson	ABARES		
Dr Mary Johnson	RMIT	Research Mgt Master Class	ACIAR Project
Dr Pratibha Singh & Ms Chetali Chhabra	ACIAR		New Delhi
Samantha Nowland		Research Mgt Master Class	
Tim Krupnik		Research Mgt Master Class	

Name	Organisation	Crawford participation	Description
Jana Phan	CropLife	Research Mgt Master Class	
Sam Coggins		RAID Master Class	
Eleanor Dean and Geoff O'Keefe	ACIAR	Outreach and Capacity Building	GEDSI informants
Assoc Prof Victor Sadras	Waite Inst S.Aust.	Host of visiting fellows	
Sam Durland	Development Consultant	Recommended by Sam Coggins	PNG Capacity Building
Kiran Subedi		Research Mgt Master Class & Crawford Fellow	UN Capital Dev't Fund, Liberia

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